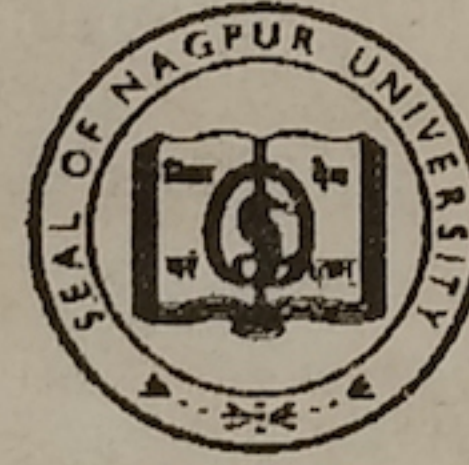


Prospectus No.
Sc. (I)
1998.

विज्ञान विद्याशाखा
विज्ञान स्नातक भाग-१, परीक्षा, १९९८.
(त्रिवर्षीय अभ्यासक्रम)

नागपूर विद्यापीठ



NAGPUR UNIVERSITY

अभ्यासक्रमिका

Prospectus

FACULTY OF SCIENCE

B. Sc. Part-I Examination, 1998.
(Three Year Degree Course)

Price : Rs. 20/-

Printed at :
Nagpur Vidyapeeth Mudranalaya, Nagpur,
1997.

NAGPUR UNIVERSITY

SPECIAL NOTE

Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects, papers or combination of papers in which students from University Department or Colleges are to be examined by the University.

Registrar,
Nagpur University

IMPORTANT NOTE FOR THE GUIDANCE OF THE STUDENTS

"Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinances Booklet concerning the various conditions/provisions pertaining to examinations as prescribed in the following Ordinances :-

- | | | | |
|---------------|-----|---|---|
| Ordinance No. | 1 | : | Enrolment of Students. |
| Ordinance No. | 2 | : | Admission of Students. |
| Ordinance No. | 4 | : | National Cadet Corps. |
| Ordinance No. | 6 | : | Examinations in General (relevant extracts). |
| Ordinance No. | 7-A | : | Condonation of Deficiency of Marks for Passing an Examination or for Improvement of Division thereat in the Faculties of Arts, Science, Commerce, Education, Social Sciences, Law, Home Science and Engg. & Technology and Examinations in Pharmaceutical Sciences. |
| Ordinance No. | 7-B | : | Condonation of Deficiency of Marks for Passing an Examination in the Faculty of Medicine (excluding examinations in Pharmaceutical Sciences). |
| Ordinance No. | 9 | : | Conduct of Examinations (relevant extracts). |
| Ordinance No. | 10 | : | Providing for Exemptions and Compartments. |
| Ordinance No. | 19 | : | Admission of Candidates to Degrees. |
| Ordinance No. | 109 | : | Recording of a change of name of a University Student in the records of the University. |
| Ordinance No. | 138 | : | For Improvement of Division. |
| Ordinance No. | 159 | : | Prescribing Rules for Revaluation of Answer Books of Examinees at University examinations. |

This booklet of Ordinance is a priced publication and will be available on sale with the approved Book-sellers and University Publication Department, University Library Building, North Ambazari Road, Nagpur".

Registrar,
Nagpur University

NAGPUR UNIVERSITY

Faculty of Science
%Ordinance No. 143

Examinations Leading to the Degree of विज्ञान स्नातक (Bachelor of Science)

- (i) The following shall be the examination leading to the Degree of विज्ञान स्नातक (Bachelor of Science), namely :
 - (a) The विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination;
 - (b) The विज्ञान स्नातक भाग-२ (B.Sc.Part-II) Examination;
 - and (c) The विज्ञान स्नातक अन्त्य (B.Sc.Final) Examination.
- and (ii) The duration of teaching for each course of examination shall be one academic year.
2. The examination specified in the preceding paragraph shall be held twice a year at such places and such on such dates as be may be appointed by the Academic Council.
3. Subject to their compliance with the provisions of this Ordinance and of other Ordinances in force from time to time, the following persons shall be eligible for admission to the examinations, namely :
 - (a) A student of a College who has prosecuted a regular course of study for not less than one academic year prior to that examination;
 - (b) A teacher in an Educational Institution eligible under the provisions of Ordinance No. 18;
 - and (c) A woman candidate who has not pursued a regular course of study.

Provided that in the case of the persons eligible under clauses (b) and (c) an applicant to the examination shall have attended a full course of laboratory instructions in a college in the subject in which laboratory work is prescribed. The candidate shall submit a Certificate to that effect signed by the Principal.
4. Every applicant for admission to examination shall :
 - (A) In case of the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination:-
have passed not less than one academic year previously the 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education with English and other Modern Indian Language together with any three Science* subjects comprised in the Faculty of Science or an examination recognised as equivalent thereto in such subjects and with such standards of attainments as may be prescribed;

%Latest amended by Ord. No. 21 of 1995.

*Management Council, accepted Dt. 19-2-1997.

Provided that students passing the 12th Standard Examination of the Maharashtra State Board of Secondary and Higher Secondary Education and offering Vocational Stream with one language only with any one of the following groups of subjects shall be eligible for admission to the B.Sc.Part-I Course with the corresponding group of subject as shown hereinunder:-

Group of subjects of 12th Standard Students offering Vocational Stream	Corresponding Next Higher Examination Groups of subject at B.Sc.Part-I
I. 1. English OR Any Modern Language. 2. Vocational Course of 200 Marks 3. Physics, Chemistry, Mathematics.	1. Physics, Chemistry, Mathematics. 2. Chemistry, Physics, Mathematics. 3. Chemistry, Mathematics, Statistics. 4. Chemistry, Mathematics, Geology. 5. Physics, Mathematics, Statistics. 6. Chemistry, Geology, Geography. 7. Chemistry, Physics, Geography. 8. Chemistry, Physics, Geology. 9. Chemistry, Mathematics, Geography. 10. Physics, Mathematics, Statistics. 11. Physics, Mathematics, Geography. 12. Physics, Mathematics, Electronics. 13. Chemistry, Physics, Electronics.
II. 1. English OR Any Modern Language 2. Vocational Course of 200 Marks 3. Physics, Chemistry, Biology.	1. Chemistry Botany, Zoology. 2. Chemistry, Zoology, Geology. 3. Chemistry, Botany, Geology. 4. Chemistry Botany, Geography. 5. Chemistry, Geology, Geography. 6. Chemistry, Zoology, Geography.

(B) In the case of the विज्ञान स्नातक भाग-२ (B.Sc. Part-II) Examination :

have passed not less than one academic year previously the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination of the University or an examination recognised as equivalent thereto;

and (C) In the case of the विज्ञान स्नातक अन्त्य (B.Sc. Final) Examination :

have passed not less than one academic year previously the विज्ञान स्नातक भाग-२ (B.Sc.Part-II) Examination of the University or an examination recognised as equivalent thereto.

*For the purpose of counting of three Science subjects offered by a candidate at 12th Standard Examination, the Subject Biology shall be counted as two Science Subject i.e. Botany and Zoology.

- Without prejudice to the other provisions of Ordinance No. 6 relating to the Examinations in General, the provisions of Paragraphs 5,8,10 and 31 of the said Ordinance shall apply to every collegiate candidate.
- The fees for the examination shall be as prescribed by the Executive Council from time to time and whenever any change is made in the fees prescribed or any particular examination that shall be notified through a notification for information of the examinees concerned.
- Every examinee for the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination shall be examined in :
 - Compulsory English.
 - Any one of the following Languages:-
Marathi, Hindi, Urdu, Gujarati, Telugu, Bengali, Sanskrit, Supplementary English
French, German, Russian, Persian, Arabic, Pali and Prakrit or Latin :
 - Subjects of any one of the following groups, namely.

(1) Chemistry	Physics	Mathematics
(2) Chemistry	Statistics	Mathematics
(3) Chemistry	Zoology	Botany
(4) Chemistry	Zoology	Geology
(5) Chemistry	Physics	Geology
(6) Chemistry	Botany	Geology
(7) Chemistry	Mathematics	Geology
(8) Physics	Mathematics	Statistics
(9) Chemistry	Zoology	Geography
(10) Chemistry	Botany	Geography
(11) Chemistry	Physics	Geography
(12) Chemistry	Geology	Geography
(13) Physics	Mathematics	Geography
(14) Chemistry	Mathematics	Geography
(15) Chemistry	Zoology	Microbiology
(16) Chemistry	Botany	Microbiology
(17) Chemistry	Biochemistry	Botany
(18) Chemistry	Biochemistry	Zoology
(19) Chemistry	Biochemistry	Mathematics
(20) Chemistry	Biochemistry	Geology
(21) Chemistry	Biochemistry	Microbiology
(22) Physics	Mathematics	Electronics
(23) Chemistry	Physics	Electronics
(24) Chemistry	Zoology	Environmental Science
(25) Chemistry	Botany	Environmental Science

- | | | |
|------------------|--------------|-----------------------------------|
| (26) Chemistry | Geology | Environmental Science |
| (27) Chemistry | Physics | Environmental Science |
| (28) Chemistry | Microbiology | Environmental Science |
| (29) Chemistry | Mathematics | Environmental Science |
| (30) Mathematics | Statistics | Computer Science |
| (31) Physics | Mathematics | Electronics Equipment Maintenance |
| (32) Chemistry | Zoology | Industrial fish and Fisheries |
| (33) Physics | Mathematics | Computer Science |
| (34) Physics | Statistics | Computer Science |
8. Every examinee for the विज्ञान स्नातक भाग-२ (B.Sc.Part-II) Examination shall be examined in each of the three Science Subject in which he has been examined at the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination.
 9. Every examinee for the विज्ञान स्नातक अन्त्य (B.Sc. Final) Examination shall be examined in each of the three Science Subjects in which he has been examined for the विज्ञान स्नातक भाग-२ (B.Sc.Part-II) Examination.
 10. An examinee who is successful at the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination, may offer an additional subject mentioned in Para. 7 (iii) not offered by him at the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) Examination, on his prosecuting a regular course of study for one academic year in that subject. Such an examinee shall not be permitted to take any other examination simultaneously with the examination in the additional subject. The fee for the additional subject shall be Rs.50-00 for the Theory Part and Rs.5-00 for the Practical Part.
 11. The scope of the subject of B. Sc. Part-I, B.Sc.Part-II and B.Sc.Final shall be as indicated in the respective syllabi in force from time to time the medium of instruction and examination shall be English except for the courses in Languages.
 12. The examination marks allotted to each subject and paper and the minimum marks which an examinee must obtain in order to pass the examination shall be as indicated in Appendices A,B.and C.
 13. Successful examinees at the विज्ञान स्नातक अन्त्य (B.Sc. Final) Examination who Obtain not than 60% marks in the aggregate of B.Sc. Part-I, B.Sc.Part-II and B.Sc. Final Examinations taken together shall be placed in the First Division, those obtaining less than 60% but not less than 45% in the Second Division, and all other successful examinees in the Third Division.

Explanation :

Division at the विज्ञान स्नातक अन्त्य (B.Sc. Final) Examination shall be declared on the basis of the marks obtained in the Science Subject at the विज्ञान स्नातक भाग-१, विज्ञान स्नातक भाग-२ व विज्ञान स्नातक अन्त्य (B.Sc. Part-I, B.Sc.Part-II and B.Sc. Final) Examinations taken together.

14. There shall be no classification of successful examinees at the विज्ञान स्नातक भाग-१ (B.Sc.Part-I) and विज्ञान स्नातक भाग-२ (B.Sc. Part-II) Examination.
15. An examinee successful in the minimum period prescribed for the examination obtaining not less than 75% of the maximum marks prescribed in the subject shall be declared to have passed the Examination with Distinction in that subject.

Explanations :

- (1) Distinction shall be awarded only in Science subjects.
- (2) Distinction at the विज्ञान स्नातक अन्त्य (B.Sc.Final) Examination, shall be awarded on the basis of the marks obtained at the विज्ञान स्नातक भाग-१, विज्ञान स्नातक भाग-२ व विज्ञान स्नातक अन्त्य (B.Sc.PART-i, B.Sc.Part-II and B.Sc. Final) Examination.
- (3) Distinction shall not be awarded to an examinee of the provision of the Exemptions and Compartments at of the Examinations.
16. Provisions of Ordinance No.7-A relating to the Condonation of Deficiency of Marks for Passing an Examination and of Ordinance No.10 relating to Examinations and Compartments as amended up-to-date vide Ordinance No.45 of 1983 shall apply to the examinations under this Ordinance.
17. As soon as possible after the examination the Executive Council shall publish a list of successful at the B.Sc.Part-I, B. Sc. Part-II and B.Sc. Final Examination. Such list at the विज्ञान स्नातक अन्त्य (B.Sc.Final) Examination shall be arranged in three division. The names of the examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in Final or Second Division shall be arranged in Order of Merit as provided in the Examination in General Ordinance No. 6. While preparing the merit list for the B.Sc. Examination the marks scored by the candidate in the compulsory languages at their part-I Examination will be taken into consideration in addition to the marks scored by them in their optional subjects.
18. No. person shall be admitted to B.Sc.Part-I, B. Sc. Part-II and B. Sc. Final Examinations, if he has already passed the corresponding or an equivalent examination of any other statutory University.
19. Successful examinees at the विज्ञान स्नातक भाग-१ (B.Sc. Part-I) and the विज्ञान स्नातक भाग-२ (B. Sc. Part-II) Examination shall be entitled to receive a Certificate signed by the Registrar, and successful examinees at the विज्ञान स्नातक अन्त्य (B.Sc. Final) Examination, shall on payment of the prescribed fees, receive a Degree in the prescribed form, signed by, the Vice-Chancellor.

APPENDIX-A
विज्ञान स्नातक भाग-१
(B. Sc. Part-I) Examination.

Subject	Examination		Maximum Marks	Minimum Pass Marks per subject
	Theory	Practical		
1. Compulsory English	1 Paper	Nil	100	35
2. Language	1 Paper	Nil	100	35
3. Mathematics	3 Papers of 50 marks each	Nil	150	53
4. Physics Botany	) 2 Papers of 60 One per 120 For Theory Part			42
Zoology, Geology,	) Marks each per subject 30 For Practical Part			11
Statistics, Geography,	) subject			
Microbiology,	)			
Biochemistry, Electronics	)			
Environmental Science	}			
and Computer Science,	)			
Electronics Equipment	)			
Maintenance, Industrial	)			
Fish and Fisheries.	)			
5. Chemistry	3 Papers of 40 Marks each	ONE 30 For Practical Part	120 For Theory Part	42 11
6. Vocational Subject Electronic Equipment Maintenance.	2 Theory Papers		100 Marks	35%
	50 Marks each			
	1 Practical		50 Marks	

APPENDIX-B
विज्ञान स्नातक भाग-२
(B. Sc. Part-II) Examination.

Subject	Examination		Maximum Marks	Minimum Pass Marks per subject
	Theory	Practical		
1. Mathematics	3 Papers of 50 marks each	Nil	150	53
2. Physics Botany	) 2 Papers of 60 One per 120 For Theory Part			42
Zoology, Geology,	) Marks each per subject 30 For Practical Part			11
Statistics, Geography,	) subject			
Microbiology,	)			
Biochemistry, Electronics	}			
Environmental Science	}			
and Computer Science,	)			
Electronics Equipment	)			
Maintenance, Industrial	)			
Fish and Fisheries.	)			
3. Chemistry	3 Papers of 40 Marks each	ONE 30 For Practical Part	120 For Theory Part	42 11
4. Vocational Subject-Electronic Equipment Maintenance.	2 Theory Papers		100 Marks	35%
	50 Marks each			
	1 Practical		50 Marks	

APPENDIX-C
विज्ञान स्नातक अन्त्य
(B. Sc. Final) Examination.

Subject	Examination		Maximum Marks	Minimum Pass Marks per subject
	Theory	Practical		
1. Mathematics	3 Papers of 50 marks each	Nil	150	53
2. Physics Botany	) 2 Papers of 60 Marks each	One per subject 30	120 For Theory Part	42
Zoology, Geology, Statistics, Geography, Microbiology, Biochemistry, Electronics	)		30 For Practical Part	11
Environmental Science and Computer Science, Electronics Equipment Maintenance, Industrial Fish and Fisheries.	)			
3. Chemistry	3 Papers of 40 Marks each	ONE	120 For Theory Part 30 For Practical Part	42 11
4. Vocational Subject-Electronic Equipment Maintenance.	1 Theory Papers	50 Marks	)	
	1 Project	50 Marks	)	
	1 Practical	50 Marks	)	35%

Note : Practical Record Book of the examinee to be submitted at the time of the Practical Examination in the subject shall carry a Certificate in the following proforma :

CERTIFICATE

Name of the College/Institution

Name of the Department

This is to certify that this Book contains the bonafide record of the practical work of Shri/Kumari/Shrimati
 of B. Sc. Part-I, B. Sc. Part-II, B. Sc. Final during the Academic year

Dated :

.....
*Signature of the Teacher who
 taught the examinee.*

.....
Head of the Department

In the absence of the above Certificate, marks assigned to the Practical Record Book shall not be awarded to the examinee.

NAGPUR UNIVERSITY

The Executive Council, dated 1/2-4-77, 11-7-77 and 2-9-77 has prescribed the Teaching periods in the various subjects in the Faculty of Science as follows:-

B. Sc. Part-I.**Examination :**

Subject	Theory	Practical
1. Chemistry	6	6
2. Physics	6+1 Tutorial	6
3. Botany	6	6
4. Zoology	6	6
5. Geology	6	6
6. Mathematics	9+1 Tutorial	..
7. Statistics	6	6
8. English	4+1 Tutorial	..
9. Electronics	6+1	6
10. Electronics Equipment Maintenance	6+1	6
11. Computer Science	6+1	6

12. Languages :

1. Supplementary English	3
2. Marathi	3
3. Hindi	3
4. Sanskrit etc.,	3

B.Sc. Part-II and B.Sc. Final.

1. Physics	6+2	6
2. Mathematics	9+1 (Tutorial)	..
3. Chemistry	6	6
4. Botany	6	6
5. Zoology	6	6
6. Geology	6	6
7. Statistics	6	6
8. Electronics	6+2	6
9. Electronics Equipment Maintenance	6+2	6
10. Computer Science	6+2	6

B.Sc. Part-III Electronics Equipment Maintenance

4+4	6
Paper -I (Theory)	Paper-II (Project)

- Notes :** (1)*The strength of a batch for Practicals and Tutorials for Under-graduate Classes shall be 16 with an addition of 10% with the permission of Vice-Chancellor.
- (2) A period will be counted of 45 minutes duration at Under- graduate level.
- (3) For Tutorial Class a batch will be of 16 students with an addition of 10% with the permission of the Vice-Chancellor per week.

*(As amended by the Management Council dated, 19-2-97.

Syllabus
Prescribed for
B. Sc. Part-I Examination, 1998.
(Three Year Degree Course)

COMPULSORY ENGLISH

(Full Marks : 100)

Time : 3 Hours)

Books Prescribed :

1. Language and Experience Edited by N.Mukherji, Published by S. Chand & Co. June 1988.
2. The Silent Song Edited by K.M. Tharakan, Published by Macmillan India, Ltd., 1993.

Unitization of Syllabus :**Unit-I Prose :**

- (a) An Educated Person : Harold Nicolson.
- (b) Translating Literature into Life : Arnold Bennet.
- (c) The Need for Religion : M.K.Gandhi.
- (d) Umbrella Morals : A.G.Gardiner.
- (e) The First Four Minutes : Roger Bannister.
- (f) The Tiger Smiled : Jim Corbett.

Unit-II Prose :

- (a) Tight Corners : E.V.Lucal.
- (b) My Lost Dollar : Stephen Leacock.
- (c) Testament : Jawaharlal Nehru.
- (d) What is Science : Georger Orwell.
- (e) Jagdishchandra Bose : Aldons Huxley.
- (f) A Trip to the Moon : Sir James Jeans.

Unit-III Poetry :

- (a) London : William Blake.
- (b) Ode to Nightingale : John Keals.
- (c) Kubla Khan : S.T.Coleridge.
- (d) Mending Wall : Robert Frast.
- (e) The Gift of India : Sarojini Naidu.
- (f) For Elkana : Nissim Ezekial.

Unit-IV Letter Writing and Grammar :

- (a) Letter Writing.
- (b) Idioms and Phrases.
- (c) Narration.
- (d) Voice.
- (e) Tense.
- (f) Concord.

Note : Questions on grammar shall be set on the prescribed prose lesson.

Books Recommended :

1. Learners English Grammar and Composition : N. D. V. Prasad Rao, S. Chand & Co. Pvt. Ltd., 1990.
2. Macmillan Grammar : A. E. Augustine, K. V. Joseph.
3. An Intensive Course in English : G. D. Sidhu, Published by Orient Longman.
4. Living English Grammar and Composition : M. L. Tickoo, A. E. Subramanian, P. R. Subramanian, Published by Orient Longman.
5. Developing Communication Skills : Krishna Mohan, Meera Banerjee, Published by Macmillan India Ltd., 1990.

Distribution of Marks :

Unit	LAQ	SAQ	VSAQ	Total
Unit-I	10	10	5	60
Unit-II	10	10	5	
Unit-I & II	10	..	..	20
Unit-III	10	10	..	20
Unit-IV	..	10	10	
	40	40	20	100

Pattern of the Question Paper

		Marks
Q. 1	(a) Unit-I One out of two question. (Answer in about 200 words)	10 Marks
	(b) Unit-II As Above	10 Marks
Q. 2	(a) Unit-I and Unit-II-As Above	10 Marks
	(b) Unit-III-As Above	10 Marks
Q. 3	(a) Unit-I 2 questions out of 4 (Answer in about 100 words)	10 Marks
	(b) Unit-II-As Above	10 Marks
Q. 4	(a) Unit-III-As Above	10 Marks
	(b) Letter Writing One out of Two	5 Marks
	(c) Idioms and Phrases-Five out of Eight	5 Marks

Q. 5 All the items are compulsory :

- | | |
|---|---------|
| (a) Unit-I & II (Two questions from each)
(Unit to be answered in one or two sentences each) | 4 Marks |
| (b) Unit-I & II-Identifications-(Three sentences from each)
Unit to be identified with its title and author) | 6 Marks |
| (c) Narration | 3 Marks |
| (d) Voice | 2 Marks |
| (e) Tense | 2 Marks |
| (f) Transformation | 3 Marks |

मराठी (आवश्यक भाषा)

वेळ : ३ तास)

(गुण : १००)

पुस्तकाचे नाव : साहित्य विहार प्रा. कोरेकर.
संपादक : प्रा. खांडेकर व प्रा. पाटील.

नेमलेले पाठ :

१. शिक्षण सर्वांना मिळालेच पाहिजे : म. जोतीबा फुले.
२. शील बनविणारे शिक्षण : स्वामी विवेकानंद.
३. यंत्राने का बेकारी वाढते : वि. दा. सावरकर.
४. अस्पृश्यतेचे मूळ वंशभेद : डॉ. बाबासाहेब आंबेडकर.
५. कृष्ण भक्तीचा रोग : आचार्य विनोबा भावे.
६. भारतीय गणिताचा सौभाग्य तिलक : श्याम मराठे.
७. दिवा आणि दिवारू : मारुती चितमपल्ली.
८. लपलेला तारा : जयंत नारळीकर.

नेमलेल्या कविता :

१. पसायदान : ज्ञानेश्वर.
२. अभंग : तुकाराम.
३. धनश्याम सुंदरा : होनाजी बाळ.
४. केवढे हे क्रौर्य : ना. वा. टिळक.
५. पृथ्वीचे प्रेमगीत : कुसुमाग्रज.
६. गतीचे गीत : बाबा आमटे.
७. दर्शन : मंगेश पाडगावकर.
८. आम्ही जळतो : केशव मेश्राम.

पाठाचे व कविताचे वर्गीकरण :

गट-१ पाठ

१. शिक्षण सर्वांना मिळालेच पाहिजे
२. यंत्राने का बेकारी वाढते

कविता

१. पृथ्वीचे प्रेमगीत
२. केवढे हे क्रौर्य

गट-२ पाठ

१. अस्पृश्यतेचे मूळ वंशभेद
२. कृष्ण भक्तीचा रोग

गट-३ पाठ

१. शील बनविणारे शिक्षण
२. भारतीय गणिताचा सौभाग्य तिलक

गट-४ पाठ

१. दिवा आणि दिवारू
२. तपलेला तारा

कविता

१. पसायदान
२. गतीचे गीत

कविता

१. अभंग
२. धनश्याम सुंदरा

कविता

१. आम्ही जळतो
२. दर्शन

प्रश्नपत्रिकेची गुण विभागणी खालीलप्रमाणे राहिल-

१. निबंध (पाठ्यपुस्तकावर आधारित तसेच सामान्य विषयावर) आणि दिर्घोत्तरी प्रश्न (गट १ व गट २ मधून) गुण ४०
२. लघुत्तरी प्रश्न (४ ही गटातून) गुण ४०
३. अतिलघुत्तरी प्रश्न (४ ही गटातून) गुण २०

एकूण गुण १००

हिंदी

समय : ३ घंटे)

(पूर्णांक : १००)

निर्धारित पाठ्यपुस्तके :

१. गध्य निधी-संपादक : जि. जयसिंह रेड्डी, एस. चांद कं. लि., नई दिल्ली.
२. काव्य मंजरी-संपादक : सविता गुप्ता, एस. चांद एंड कं. लि. नई दिल्ली

प्रथम इकाई के लिए निर्धारित पाठ :

१. अमरता की गोद में, २. जहाँनारा, ३. जमाखोर की क्रांति, ४. बाल लीला: सूरदास (कविता और ५. इंसान और कूते : हरिवंशराय बच्चन (कविता).

द्वितीय इकाई के लिए निर्धारित पाठ :

१. अनोखा ब्याह, २. सुना कुत्ता, ३. रजिया, ४. दोहे : रहीम (कविता), ५. उधार, सांप : वात्सायन अशेष (कविता)

तृतीय इकाई के लिए निर्धारित-पाठ :

१. कल की बात, २. सोना, ३. गदा युह, ४. विधवा : निराला (कविता) ५. पोस्टर और आदमी: सर्वेश्वर दयाल सक्सेना (कविता).

चतुर्थ इकाई के लिए निर्धारित पाठ :

१. पुरजे, २. मेहमान, से भगवान बचाए, ३. कविता की मौत : धर्मवीर भारती (कविता) ४. गीत फरोश : भवानी प्रसाद मिश्रा (कविता), ५. सौंदर्य प्रतियोगिता : नागार्जुन (कविता).

अंको का विभाजन :

दोर्घोत्तरी प्रश्न	४०
लघुत्तरी प्रश्न	४०
अतिलघुत्तरी प्रश्न	२०

पूर्णांक : १००

GUJARATHI, TELUGU AND BENGALI
GUJARATHI

Time : 3 Hours)

(Full Marks : 100)

- | | |
|--|----------|
| 1. Poetry : Text | 60 Marks |
| 2. Unseen Passage for explanation (Prose) | 10 Marks |
| 3. Translation | 10 Marks |
| 4. Essay (Subject of essay should also include topics from the Text) | 20 Marks |

Poetry Text Book :

कलापी नो काव्यकलाप (संपादक - अनंतराय म. रावळ.
प्रकाशन-गुर्जर ग्रंथरत्न कार्यालय, गांधी रस्ता, अहमदाबाद).

Note : Critical study of the Poetry. Text is not expected. The Text is meant only for general study.

TELUGU

Time : 3 Hours)

(Full Marks : 100)

There will be only ONE PAPER of three house' duration carrying one hundred marks :

- | | |
|--|----------|
| (a) Two general questions from the Text for Detailed Study | 50 Marks |
| (b) Two general questions from the Rapid Reader | 30 Marks |
| (c) Essay | 20 Marks |

Books Prescribed :

1. Stories of the Authors :
(i) Ponuganbi, (ii) Krishna Sastri, (iii) Narayan Reddy from the Book "SHATPADHI" published by Teaching of Aids, Guntur-2 (A.P.)

2. The Nehru-You Don't Know (Telugu trapslation, viz, Miirerugani Nehru) by Lalita, published by National Book Trust, India, A-5, Green Park, New Delhi.

BENGALI**(Full Marks : 100)****Time : 3 Hours)**

There will be one Paper of three hours' duration carrying 100 Marks.

- | | | |
|---|----|----------|
| (a) Two general questions from Palli Samaj | .. | 40 Marks |
| (b) Two general questions from Bichitra Prabandha | .. | 40 Marks |
| (c) Essay | .. | 20 Marks |

Books Prescribed :

- Novel* : Palli Samaj : Sarat Chandra.
Prose : Bichitra Prabandha : Rabindranath Tagore (Vishwa Bharati).

SANSKRIT (Compulsory)**(Full Marks : 100)****Time : 3 Hours)**

पुष्पहार : भाग-१ (नागपूर विद्यापीठ प्रकाशन)

Supplementary English**(Full Marks : 100)****Time : 3 Hours)****Books Prescribed :**

- Hall of Fame Edtied : David Horsburch.
- KIM Rudyard Kipling Edited : May Manjit Sen. Published by Orient Longman.1988.

Unitization :**Unit-I :**

General Essay.

Unit-II :

Hall of Fame :

- Socrates.
- Joan of arc.
- Abracham Lincon.
- Louis Pasteur.

Unit-III :

Hall of Fame :

- Tolstoy.
- Rabimdranath Tagore.
- Mahatma Gandhi.
- Albert Elstein.

Unit-IV :

KIM

Distribution of Marks :

Unit	LAQ	SAQ	VSAQ	Total
Unit-I	20	..	..	20
Unit-II	10	10	10	30
Unit-III	10	10	10	30
Unit-IV	10	10	..	20

Pattern of Question Paper :

- Q. 1 : From Unit-I
 An Essay of about 400 words on a topic of curent intrest out of four 20 Marks
- Q. 2 : (a) One question out of two on Unit-II to be answered in about 200 words 10 Marks
 (b) One question out of two on Unit-III to be answered in about 200 words 10 Marks
- Q. 3 : From Unit-II & Unit-III
 (a) Two questions out of four based on Unit-II to be answered in about 50 words each 10 Marks
 (b) Two questions out of four based on Unit-III to be answerd in about 50 words each 10 Marks
- Q. 4 : From Unit-IV
 Four questions out of eight with internal choice 20 Marks
- Q. 5 : From Unit-II & III /
 Ten very short answer questions with no choice 20 Marks

URDU**(Compulsory)****Time : 3 Hours)****(Full Marks : 100)**

- | | | | | |
|---------------------------------------|----|----|----|----------|
| 1. Prose Text | .. | .. | .. | 40 Marks |
| 2. Rapid Reading | .. | .. | .. | 20 Marks |
| 3. Essay | .. | .. | .. | 20 Marks |
| 4. Translation from English into Urdu | .. | .. | .. | 20 Marks |

 Total : 100 Marks

(Note : Passage will be taken from the selected lessons from the text books prescribed for Compulsory English at the current B. Sc. Part-I Examinations.)

Books Prescribed :

1. Prose :
Adabi Sceparay (Prose) Edited by K. R. Siddiqui (Shri Ram Mehra Co., Educational Publishers, Agra).

ادبی سنپارے - حصہ نثر - مؤلف خلیل الرحیم

The following lessons are prescribed :

- (۱) موزا غالب - خطوط غالب
- (۲) مولانا حالی - غزل کی اصلاح
- (۳) شرر - لکھنؤی فنون ادب کی ترقی
- (۴) عبدالحق - ادب اردو اور ہندوستان
- (۵) مولانا عبدالمجید - اکبر کی شاعری کا معاشرتی و اخلاقی پس منظر
- (۶) پریم چند - روشنی
- (۷) مسعود حسن رضوی - اردو شاعری میں تمثیل
- (۸) کنہیا لال کھنر - بے تکلفی

2. Rapid Reading :

مؤلولی عبدالحق - چند نثر

MODERN EUROPEAN LANGUAGES FRENCH

Time : 3 Hours)

(Full Marks : 100
Paper : 80
Viva-Voce : 20

There will be ONE PAPER of three hours' duration and a VIVA VOCE examination.

The distribution of marks will be as follows :

Paper	Viva-Voce
(a) Text	20 Marks
(b) Grammar	20 Marks Dictation 5 Marks
(c) Rapid Reader	15 Marks Comprehension 5 Marks
(d) Translation (both ways)	10 Marks Conversation 5 Marks
(e) Composition	15 Marks Reading 5 Marks
	80 Marks 20 Marks

Text Prescribed :

1. For Detailed Study : Cours de Langue et de Civilization : Tome 1. G. Mauger, Lessons-1 to 49.
2. For Rapid Reading : Petis Recits de Grauds. Ecrivains : Edited by G.A. Deleury, Y.K. Sohony, Stories : 3, 4, 11, 13.

GERMAN

Time : 3 Hours)

(Full Marks : 100
Paper : 80
Viva-Voce : 20

There will be ONE PAPER of three hours' duration and a VIVA-VOCE examination.

The distribution of marks will be as follows :

Paper	Viva-Voce
(a) Text & Grammar	40 Marks Dictation 5 Marks
(b) Rapid Reader	20 Marks Comprehension 5 Marks
(c) Translation	10 Marks Conversation 5 Marks
(d) Composition	10 Marks Reading 5 Marks
	80 Marks 20 Marks

Text for Detailed Study :

Deutsch Sprachlehre Fuer Auslaender : Teil-II :

Rapid Reading :

1. Wir Lessen-Deutsche : Teil-I by Schroeder Kirchoff (from lessons 16 upto the end).
2. Wir Lessen-Deutsche:Teil-II(Lessens 1 to 15 only) Translation, Composition etc.

RUSSIAN**Time : 3 Hours)****(Full Marks : 100**

There will be one WRITTEN paper of THREE hours' duration carrying 80 marks and a VIVA-VOCE examination carrying 20 marks. The distribution of marks will be as follows.

	Marks
(1) Grammar	40
(2) Essay	20
(3) Passage for Translation :	
(a) from Russian into English/Marathi	10
(b) from English into Russian	10
Viva-Voce	20

	Total : 100

Text Books :

"Russian for Everybody" by E.Stepanova et al, edited by V. Kostomarov, 3rd edition, "Russian Language Publishers" Moscow, 1977, Lessons 1-30.

Books Recommended for additional reading :

1. Simile Jokes, anecdotes, short stories, compiled by B. G. Applilogova et al. Progrss Publishers, Moscow.
2. Russian in Exercises by S.Khavronina & A. Shirodhenskaya.

PHYSICS

For development of all topics in physics system, Inter national (SI) should be followed. Final formulae may be stated using C.G.S Ghausian system.

PAPER-I**Mechanics, Acoustics and Thermodynamics****Unit-I :**

Gravitational force and potential:- Force between a point mass and a spherical shell (Derivation of expression), Force between a pointmass and a solid sphere (dirivation of) Gravitational and electrostatic self energy, Gravitational energy of Galaxy. (Ref. Berkley series, chap. IX).

Elasticity :

Longitudinal elongation per unit stress (Alpha) and lateral contraction per unit stress (beta), poison's ratio, relations between Y. K. and n in terms of alpha, beta and sigma, limits of poisson's ratio; Bending of beams, bending moment, expression for bending couple, expression for the depression at a free end of a light cantilever; Expression for a torsional couple, torsional pendulum (theory) and n by torsional pendulum.

Fluid Machanics :

Stream line and Turbulent flows, critical velocity, Reynold number and its significance, coefficient of viscosity, poiseuille's equation, Berno surface wulli's theorem and its application atomiser and lift of an aeroplane.

Surface Tension :

Definition, expression for excess pressure on a curve (single and double) curvatures, application to a drop and bubble, vapour pressure and formation of a raindrop.

Unit-II :

Simple Harmonic Motion:-Analytical treatment of a resultant of two mutually prependicular SHMs, Lissajous figures (for frequency ratios 1:1 and 1:2) (different amplitudes and phases) and its applications.

Oscillatory Motion :

Free, damped and forced vibrations, resonance with respect to the frequency of periodic force and natural frequency, amplitude, sharpness, band nwilth and Q factor. Fourier(theorem and its applications to periodic fuctions, sacotooth and square), Doppler's effect in sound reverberation and sabine's formula.

Unit-III :

Expression for critical constants assuming Vander Wall's equation, physical ideas of thermal equilibrium, Law of equipartition of energy and its illustrations, Degree's of freedom specific heats of mono and polyatomic molecules, Derivation of mean free path, transsport phenomena, expression for condutivity and viscosity of gases and relation between them. Isothermal and Adiabatic processes, Derivation of adiabatic relations, work done during these processes.

Unit-IV:

Thermal conductivity of intensive and extensive variables with suitable examples, Concept of internal energy, Zeroth law and first law of thermodynamics, Reversible and irreversible changes, Carnot's Engine and cycle, Derivation of efficiency, Carnot's theorem, Second law of thermodynamics and Kelvin's scale, Clausius-Calpeyron's Entropy and its physical significance, changes in entropy in reversible and irreversible changes, Heat Death of Universe. Joule-Thomson's effect, Porous plug experiments, application to refrigeration.

PAPER-II**Optics, Electromagnetism and Modern Physics****Unit-I:**

Geometrical optics:- Defects of images, spherical aberration, astigmatism and coma (qualitative), methods to reduce these defects (one each), chromatic aberration, lenses in contact to reduce chromatic aberration, Huygen's and Ramsden's eyepieces (qualitative discussion).

Interference:

Interference in thin films (Reflected and transmitted systems), colours in thin films, Haidinger and Fizeau's fringes, Newton's rings in reflected system.

Diffraction:

Half period elements, Fresnel's diffraction by a narrow slit, Fraunhofer's diffraction of a single and double slit, (qualitative discussion, deleting absent spectro), theory of plane transmission grating.

Unit-II:

Angular dispersion in a prism, dispersive power of prism and grating, Rayleigh's criterion of resolution, resolving power of grating and telescope, comparison of grating and prism spectra.

Polarization:

Concept of polarization, Brewster's law, double refraction in uniaxial crystal, birefringence in uniaxial crystal in relation to structure of calcite and quartz, Huygen's theory of double refraction in uniaxial crystal, Nicol prism, elliptically and circularly polarized light, scattering of light and blue of the sky.

Unit-III:

Electromagnetism: field along an axis of a circular coil, theory of B.G. Effect of damping, current and charge sensitivities, self and Mutual induction, definitions of L and M, their units and dependence on various parameters (Qualitative), growth and decay of current and charge in LR, and CR circuits, only oscillatory discharge in LCR circuit. A.C. and A.C. applied to LCR circuit (differential method). J Operator, its applications to LR, CR and LCR circuits, phasors, Transformer (ideal), its parameters L_p , L_s , M and K , Transformer losses, Transformer on load.

Unit-IV:

Series and Parallel resonant circuits, Q and sharpness of resonance, Effect of R on sharpness, Power in A.C. circuits.

Modern Physics:

Motion of a charge-particle in electric, magnetic and electromagnetic fields, velocity selector, isotopes, parabola method to determine m of isotopes, e by Millikan's oil drop method.

Electronics:

PE diagram of junction diode, Bridge rectifier with filters (C.L.C and II only Physics ideas), Regulation, Avalanche and Zener breakdown, Zener diode, its use as voltage regulator concepts of LED.

LIST OF EXPERIMENTS

A student has to perform at least TEN Experiments from each group and Two experiments in the practical examination one from each group.

Error should be calculated and result should be expressed in significant figures (Mean value + mean deviation) where ever possible.

1. Use of travelling microscope for determination of internal and external diameters of a capillary (12 readings by rotating the capillary and to calculate absolute error, percentage error, deviation and mean deviation and express the result in significant figures).
2. Determination of Y of a material of a beam by bending.
3. Determination of Y of a material of beam by single cantilever.
4. Determination of N of a material of a wire by Maxwell's needle.
5. n of a material of a wire using torsional pendulum.
6. n of material of a rod by statical method.
7. Coefficient of viscosity of water by Poiseuille's flow method.
8. Determination of surface tension of water by Jaeger's method.
9. Surface tension of mercury by Quinke's method.
10. Coefficient of thermal conductivity of rubber.
11. Coefficient of thermal conductivity of glass by Lee's disc method.
12. Determination of J by Callender & Barne's method.
13. Verification of inverse variation of frequency of Helmholtz' resonator with its volume and to calculate neck correction.
14. Determination of a frequency of A.C. mains using a sonometer.

15. Determination of G by using bar compound pendulum and to find length of equivalent simple pendulum.
16. V. by vibration method.

GROUP-B

1. Resistance of moving coil galvanometer by substitution method, (Half deflection method) and calculate absolute error, percentage error, mean deviation and resulting significant figures.
2. Determination of the wavelength of sodium light by a prism.

Reference Books :

1. Properties of Matter : D.S.Mathur.
2. Properties of Matter : Upadhyaya.
3. Treatise on Heat : Saha and Srivastava.
4. Heat : D.S.Mathur.
5. Optics : Brijlal and Subramaniam.
6. Optics : Mathur.
7. Optics : Jenkins and White.
8. Optics : Ditchburn.
9. Text Book of Light : Krishnamurty, Rammurty and Rajagopalan.
10. Optics : Khanna and Gulati.
11. Electricity and Magnetism : Vasudeva.
12. Electricity and Magnetism : Fuks and Yarwood.
13. Basic Electronics : Grob.
14. Basic Electronics : Desai.
15. Basic Electronics : Mittal.
16. Thermodynamics and Electromagnetism : Bhatwadekar, Jaganmadhawa Jain.
17. First Year Physics, Paper-I : Hirade & Jawadekar/Jai.
18. First Year Physics, Paper-II : Hirade & Jawadekar.
19. College Physics, B. Sc.Part-II, Paper-I & II : B. V. Lagu and V.G.Dixit.
20. A Text Book of First Year Physics, Vols. 1 & 2 : M.K. Bagade & S.P. Singh.
21. B. Sc.Part-I Papers-1 & 2 : Kale, Dharmadhikari, Gokhale and Nadgawda.
22. A Text Book of Physics : Kale, Bade, Nadgawda and Navneeth.

23. A Text Book of Physics : Practical Physics for B.Sc. Part-I : Kale, Bade, Dharmadhikari, Nadgawda and Navneeth.

CHEMISTRY

There shall be three compulsory papers in theory as stated below and practical examination extending for 6 hours. Every examinee shall offer the following three papers of 40 marks each and practical examination of 30 Marks.

Theory Papers

	Marks
1. Paper-I Inorganic Chemistry	40
2. Paper-II Organic Chemistry	40
3. Paper-III Physics Chemistry	40
4. Practical	30

Total : 150

Paper-I (Inorganic Chemistry)

Unit-I :

(a) Structure of Atom :

Bohr's Atomic model with merits and demerits. Meaning of and Quantum numbers. Shapes of s, p and d orbitals. Radial distribution curves of 1s, 2s and 2p orbitals. Pauli's exclusion principle, Hund's rule, Auf Bau principle, Evaluation of quantum numbers for electron systems. Writing of complete electronic configurations of elements/ions. (6 Periods).

(b) Periodic of Elements :

Periodic classification in terms of s, p, d, and f block elements. Long form of the Periodic table Periodicity of properties with reference to atomic radii ionisation potential, electron affinity and electronegativity. Successive Ionisation potentials, factors affecting ionisation potential. Explanation of the terms ionic radii, covalent radii and van der Waals radii. Pauling's and Mulliken's scale of electronegativity. Slater's rules for determining screening constant and effective nuclear charge with some exercises. (6 Periods).

Unit-II :

(a) Ionic Bond :

Formation of ionic bond in terms of ionisation potential, electron affinity and lattice energy with respect to Sodium Chloride. Determination of lattice energy by Born-Haber cycle. solvation of ions, solvation energy and determination of solvation energy. Polarising power and polarisability Pajan's rule. Packing of ions in simple crystals in terms of size and radius ratio rule, (4 Periods).

(b) Covalent Bond :

Bond Parameters: Bond length, Bond order, Bond angle, and Bond energy.

Heatler-London theory of covalent bonding. Formation of H_2 molecule using various potential energy curves in potential energy diagram. Limitations of valence bond theory.

Concept of Resonance and Resonance energy : Definition, rules for writing canonical form with examples of simple inorganic molecules like-HCL, CO, NO and NO_2 .

Overlap criterion of bond strength. Directional characteristic of covalent bond.

Hybridisation : sp , sp^2 , sp^3 , sp^2 , ap^3 , d^3 hybridisation in simple inorganic compounds. (8 Periods).

Unit-III :

- (a) Systematic study of s-block elements with reference to electronic configuration, reducing properties and their diagonal relationship. Hydrogen : Isotopes of hydrogen, Preparation, properties and uses of D_2 and D_2O (Taylor, Ening, and Frost's method) (5 Periods).
- (b) Physico-Chemical Principles involved in Chemical Analysis : Common Ioneffect and solubility product and their applications in inorganic qualitative analysis. Numerical problems.(3 Periods).
- (c) Oxidation Reduction : Distinction between valency and oxidation state. Explanation of terms : Oxidation, Reduction, Oxidising agent in terms of electrons and oxidation number. Determination of oxidation number in molecules/ions. Balancing of redox equations using : oxidation number method and Ionelectron method. Equivalent weights of oxidising and reducing agent (Definitions and Calculations). (4 Periods)

Unit-IV :**(a) Metallurgy :****(i) General Princilpes in Metallurgy :**

- (a) Preliminry treatment of an ore.
- (b) Concentration.
- (c) Calcination and Roasting.
- (d) Smelting.
- (e) Refining.

- (ii) Furnances in Metallurgy,
 - (a) Blast furnace.
 - (b) Reverberatory furnace.
 - (c) Bessemer's Converter (6 Periods).

- (b) Chemistry of Copper and Aluminium :
Occurrence, extraction, purification, properties and uses. (6 Periods).

PAPER-II ORGANIC CHEMISTRY**Unit-I :**

- (A) Introduction to Bonding in organic compounds, Polarity of Bond, Dipole moment, Inductive effect, Conjugation, Hyperconjugation, Bond fission.

Types of Reagents:- Electrophile, Nucleophile. Types of Intermediates:- Carbocation and carbanion, free radicals and their relative stability, Carbenes. Types of Reaction:- Addition, Substitution, Elimination and Rearrangement with suitable example. (6 Periods).

- (B) Alkanes : Reactions:- Substitution, Pyrolysis, isomerism Cyclisation, L. P. G., definition of calorific value, Free radical mechanism of halogenation of methane.

Cycloalkanes : Preparation of cyclohexane from benzene, Phenol. Reaction-Oxidation, Sulphonation hydrogenation, dehydrogenation conformations of ethane and Butane, Baeyer's strain theory. Theory of strainlers ring. Conformations of cyclohexane. Axial and Equatorial Bonds.

Unit-II :

- (A) Alkenes : Methods of Preparation of Propylene by dehydration dehydrohalogenation and dehalogenation (mechanism not expected)

General Reactions : Addition Reactions- Addition of hydrogen, halogen, halogen acids, hypohalous acid, Ozone, Sulphuric acid and hydration. Oxidation Reactions- alkaline paramganate, periodic acid and siluer catalyst with reference to ethylene and propylene. Mechanism of addition of Bromine to ethylene mechanism of addition of HBr to propylene-ionic and free radical mechanism. (6 Periods).

- (B) Alkadienes : Classification, methods of preparation of 1,3 butadine and its addition reaction with H_2 , S_2 and HX. Mechanism of 1,2 and 1,4 addition reaction. Diel's Alder Reaction (mechanism not expected).

Alkynes-General methods of preparation and reactions. Addition reactions, Acidity and oxidation (with reference to actylene) and substitution. Organometallic compounds : Definition, Grignard Reagent-Preparation. Tetra ethyl Lead-Preparation and use as antiknock reagent. Octane number. (6 Periods).

Unit-III :

- (A) Benzene : Coal tar distillation products, Isolation of benzene from Coaltar, Reaction of benzene, Aromatic Character of benzene, Structure of Benzene including resonance structure and orbital diagram. General Mechanism of Electrophilic substitution in Benzene. Mechanism of nitration and sulphonation with energy profile diagram. (6 Periods).
- (B) Modern theory of orientation in benzene : Activating and deactivating groups, Directive influence of groups. Nuclear and side-chain halogen, substituted derivatives of benzene. Chlorobenzene and benzyl chloride-Preparation and reactions. Reactivity of Ethyl-chloride, Chloro-benzene and benzyl chloride. Preparation and uses of B. H. C. (6 Periods).

Unit-IV :

- Alcohols :** Manufacture of ethyl alcohol by fermentation from molasses and starch, Distinction between Primary, Secondary and Tertiary alcohols. Rectified spirit, Absolute alcohol, Denatured spirit, power alcohol (Definition and composition).
- Epoxide :** Ethylene oxide- preparation and properties.
- Glycol :** Preparation and reactions. Mechanism of Pinacol-Pinacolone rearrangement reaction.
- Glycerol :** Synthesis from propene. Manufacture from soap industry. Reaction and uses.
- Phenols :** Nomenclature, Acidity of Phenol, Effect of substituents on acidity. Mechanism of Reimer Tiemann's reaction, Kolbe's reaction, Frie's reaction, Coupling reaction. (Mechanism not expected). (12 Periods).

Paper-III
(Physical Chemistry)

Unit-I :

- (A) Structure of Atom: Bohr's model of an atom, Derivation of expression for radii of orbits and energies of electrons. Calculations of wave-length and frequency during transitions of electrons. Limitations of Bohr's model.

Wave particle duality, de-Broglie's equation, Proof of Bohr's quantum condition from de-Broglie's equation, verification of wave nature of electrons by Davisson and Germer's experiment. Heisenberg's uncertainty principle, Schrodinger's wave equation (No derivation), Physical interpretation of wave function. Wave functions for 1s, 2s and 2p for hydrogen atom be mentioned, Variation of wave function with distance (r) for 1s, 2s and 2p, Application of wave equation to a particle in one dimensional box-energy, wave function. Curves for wave function and probability densities of a particle in a box. Numerical problems. (6 Periods).

- (B) Adsorption and Catalysis: Physical and chemical adsorption, Adsorption isotherms. Freundlich's adsorption isotherm. Langmuir's adsorption isotherms-derivation. Determination of surface area. Applications of adsorption.

Catalysis : Definition, Characteristics. Influence on the rate of reaction and energy of activation.

Types of catalysis : Homogeneous, Heterogeneous. Auto-catalysis. Modern theory of contact catalysis. Industrial applications (6 Periods).

Unit-II :**Gaseous State :**

- (A) Postulates of kinetic theory of gases. Kinetic gas equation-derivation. Deductions of gas laws from kinetic gas equation. Maxwell-Boltzmann's distribution of molecular velocities (only qualitative treatment). Effect of temperature on molecular velocities root mean square, average and most probable velocities, their interrelationships and calculations. Mean free path, collision diameter and collision number, Calculations for like molecules. Numerical problems (6 Periods).
- (B) Ideal gas and real gas. Deviation from ideality. Compressibility factor. Vander Waal's equation of state. Explanation deviations. Critical phenomenon. Calculations and experimental determination of critical constants. Reduced equation of state. Law of corresponding states. Numerical problems. (6 Periods).

Unit-III :

- (A) First law of thermodynamics state functions, Enthalpy and enthalpy changes. Heat capacity. Relation between C_p & C_v . Ratio of heat capacities (γ) isothermal and adiabatic changes. Derivation of P-V-T relationships in an adiabatic change. Joule-Thomson Effect, Porous plug Experiment, Joule-Thomson coefficient. Inversion temperature. Numerical problems (6 Periods).
- (B) Applications of first law of thermodynamics. Standard state. Enthalpies of formation combustion solution, dilution, neutralisation, ionisation. Hess's law of constant heats summation. Bond energy calculation from thermochemical data. Numerical problems (Periods).

Unit-IV :

- (A) Liquid State: Surface tension-Definition. Determination by capillary rise and stalagmometer method. Viscosity-Definition. Determination by Ostwald's Viscometer method. Refractive index-definition. Determination by Abbe's Refractometer. Applications of Refraction in deciding chemical constitution Numerical Problems. (6 Periods).

(B) Chemical Kinetics: Concept of reaction rate. Rate constant, molecularity and order of reaction. Derivations of rate equation for first and second order reactions. Determination of order of reactions.

- (i) Using rate equation.
- (ii) Equifractional parts method.
- (iii) Graphical method.
- (iv) Ostwald's isolation method.

Reaction of zero order. Effect of temperature on the rate of a reaction. Arrhenius equation. Concept of energy activation. Numerical problems (6 Periods).

PRACTICALS

(A) Inorganic Chemistry :

Qualitative analysis of inorganic mixtures involving the combination of two basic radicals of the same group and two acid radicals.

(B) Organic Chemistry :

(a) Organic Preparations.

- (1) Acetylation of Salicylic Acid/Aviline/Glucose.
- (2) Benzoylation of Aviline/Phenol/Glycine.
- (3) Preparation of Iodoform.
- (4) Nitration :
 - (a) Preparation of m-dinitrobenzene from nitrobenzene.
 - (b) Preparation of p-nitroacetanilide from acetanilide.
- (5) Bromination of phenol/Aviline/Acetanilide.
- (6) Hydrolysis of Avilides/Amides.
- (7) Oxidation of Benzaldehyde to Benzoic Acid.
- (8) Reduction of m-dinitrobenzene to m-nitroaniline.
- (9) Diazotisation- Preparation of methyl red/methyl orange.
- (10) Preparation of Bakelite from Phenol.

Recrystallization of these should be given in case of above preparation wherever possible. Yield and melting point should also be determined.

Group-A :

- (i) To determine the solubility of benzoic acid at different temperatures and hence determine enthalpy of solution.
- (ii) To determine the enthalpy of ionisation of weak acid (Enthalpy of neutralisation of strong acid-strong base should be also determined).
- (iii) To determine the heat of dilution of sulphuric acid and determine the strength of unknown sample of sulphuric acid.
- (iv) To determine heat of solution of potassium nitrate.

Group-B :

- (i) To determine the relative viscosity of the given liquid by Ostwald's viscometer.
- (ii) To determine the percentage composition of the given mixture of liquids by Ostwald's viscometer.
- (iii) To determine the surface tension of the given liquid by using stalagmometer.
- (iv) To find parachor value of CH_2 group.

Note : Density if necessary should also be determined by any suitable methods.

Group-C :

- (i) To study inversion of canesugar polarimetrically.
- (ii) To determine the rate constant of the hydrolysis of methyl acetate in presence of an acid.
- (iii) To determine the constant of the persulphate-iodide reaction ($a = b$) as 'iodine clock reaction'.
- (iv) To study the kinetics of saponification of ethyl acetate ($a = b$).

Group-D :

- (i) To study the adsorption of acetic acid/oxalic acid on activated charcoal and verify Freundlich's adsorption isotherm.
- (ii) To study the adsorption of iodine on activated charcoal.
- (iii) To find the refractive index of a given liquid and hence specific and molar refraction.
- (iv) To determine the composition of a binary mixture (salt and water/Glycerol and water) refractometrically.

Distribution of Marks :

Viva	:	3
Sessional	:	3
Inorganic Chemistry Expt.	:	8
Organic Chemistry Expt.	:	8
Physical Chemistry Expt.	:	8
Total Marks		30

Books of Inorganic Chemistry :

1. B. H. Madan : University Chemistry.
2. H. J. Sienko and R. A. Plane-Chemistry : Principles and Properties.
3. W. T. Lippincott, A. B. Carey and F. H. Verhock : Chemistry, A Study of Matter.
4. R. E. Dickerson, H. S. Gray and G. P. Haight : Chemical Principles.
5. C. N. R. Rao : University General Chemistry.
6. G. T. Miller : Chemistry, A Basic Introduction.
7. G. T. Miller : Chemistry, A Contemporary Approach.
8. W. R. Keen, M. J. W. Rogar and P. Simpson : Chemistry, Facts, Patterns & Principles.
9. Gilreath : Fundamental concepts of Inorganic Chemistry.

10. Douglas and N. C. Daniel : Concepts and Models in Inorganic Chemistry.
11. Hislop and Robinson : Inorganic Chemistry.
12. Harvey and Porter : Introduction to Physical Inorganic Chemistry.
13. Hoeller : Advanced Inorganic Chemistry.
14. Vogel : A Text Book of Qualitative Inorganic Chemistry.
15. G. I. Brown : A New Guide to Modern Valency Theory.
16. Manas Chandra : Atomic Structure and Chemical Bonding.
17. Palling : The nature of Chemical Bond.

Books of Organic Chemistry :

1. I. L. Finar : Organic Chemistry, Vols. I & II.
2. R. T. Morrison and R. N. Boyd : Organic Chemistry (4th Ed).
3. Mackenzie : Unified Organic Chemistry.
4. R. C. Whitefield : A Guide to understanding Basic Organic Reactins.
5. D. J. Cramm and G. S. Hammend : Organic Chemistry.
6. L. E. Fieser and M. Fieser : Advanced Organic Chemistry.
7. J. D. Robert & M. C. Casserio : Modern Organic Chemistry.
8. J. March : Advanced Organic Chemistry.
9. Ferguson : Text Book of Organic Chemistry.
10. G. W. Weeland : Advanced Organic Chemistry.
11. I. L. Finar : Problems and their Solutions in Organic Chemistry.
12. S. M. Mukherji and S. P. Singh : Reaction Mechanism in Organic Chemistry.
13. E. L. Eliel : Stereochemistry of Carbon Compounds.
14. P. Sykes : A Guide Book to Mechanism of Organic Chemistry.
15. Surrgey : Name Reactions in Organic Chemistry.
16. R. O. C. Norman : Principles of Organic Synthesis.
17. H. O. House : Modern Synthetic Reactions.
18. A. I. Vogel : Quantitative Chemical Analysis.
19. A. I. Vogel : Text Book of Practical Organic Chemistry.
20. C. N. R. Rao and U. C. Agrawal : Experiments in General Chemistry.
21. Ray, O. Brewster, Calvin A. Vandewolf and William McEwen : Unitized Experiments in Organic Chemistry.
22. P. R. Singh, D. S. Gupta and K. S. Bajpai : Experimental Organic Chemistry Vols. I & II.
23. H. T. Clarke, Ed. and Arnold : London, A Hand Book of Organic Analysis.
24. P. J. Hill : Small Scale Organic Preparations.

Books for Physical Chemistry :

1. Physical Chemistry : Walter J. Moore, 5th edition, New Delhi.
2. Physical Chemistry : G. M. Barrow, Macgraw Hill, Indian Edition.
3. Chemistry : W. F. Sheehan, Prentice Hall, Indian Edition.
4. Physical Chemistry : G. W. Castellan, Addison-Wesley.
5. Principles of Physical Chemistry : Maron and Prutton.

6. Principles of Physical Chemistry : Puri, Sharma, Pathania.
7. Physical Chemistry : Wasu, Waghale, Kale.
8. Physical Chemistry : Rakshit.
9. Modern Physical Chemistry : V. G. Ratolikar, S. S. Ogale.
10. Physical Chemistry : Puri, Sharma, Nagin & Co. New Delhi.
11. T. B. of Physical Chemistry : P. L. Soni, O. P. Dharmarha.
12. T. B. of Physical Chemistry : B. D. Khosla.
13. Practical Physical Chemistry: Palit & De.
14. Practical Chemistry : Wasu, Waghale, Kale.
15. Practical Physical Chemistry : Yadao.
16. Practical Physical Chemistry : Khosla.
17. Basic Practical Chemistry : M. R. Awode.
18. Laboratory Manual of Physical Chemistry : W. J. Popiel.

Environmental Science**Unit-I :****Paper-I :**

Classification of Total Environment : External Structure of the earth (Litho sphere, biosphere and atmosphere); Geochemical evolution of earth; Geological processes; rocks, their types and formation; weathering, Natural resources of the earth; water, minerals and fuels. (15 Periods).

Unit-II :

Climatology (Weather and Climate) : Structure composition and vertical division of earth atmosphere; its temperature distribution, Lapse rate, inversion; Pressure variation, humidity and its measurement; vapour pressure, saturated vapour pressure, condensation; Cloud formation, their classificational precipitation; fog, mist, smog, winds and their origin, Predominant wind patterns; Anemometry. (15 Periods).

Unit-III :

Hydrosphere : Hydrologic cycle; Chemical composition of surface, ground and sea waters and their variation due to natural and man made activities; Water quality criteria for drinking, irrigation and industrial purpose, water resources; surface, ground and sea/ocean, geothermal water, physico-chemical indicators of water quality; PH, total solids, conductivity, Hardness, Alkalinity. Temperature, D. O., CO₂, chlorides, sulphates, viscosity and surface tension. (15 Periods).

Unit-IV :

Soil : Formation of soil and its composition; Factors affecting soil formation, soil profile and soil classification, Physical and Chemical properties of soil, Humus; its nature and formation; Role of organism in soil fertility. (15 Periods).

Paper-II

Unit-I :

(a) Community Ecology : Definition and history, Characteristics of community-composition, structure, origin and development. Methods used in the study of community, classification of communities with reference to terrestrial, aquatic and aerial environment.

(b) Interspecific relationship : Neutralism, Mutualism, commensalism, parasitism, Predation and competition.

Unit-II :

(a) Economic importance of the following groups :

- (i) Protozoa,
- (ii) Helminthes,
- (iii) Arthropoda,
(Apiculture, Sericulture)
- (iv) Molluses (Fisheries).

(b) Introduction to marine environment :

Physical and Chemical factors with particular reference to tides, waves, ocean currents, light, temperature, salinity, Oxygen and Carbondioxide Marine resources-algal, and animal resources, petroleum deposits, fouling and boring organisms, their economic importance and preventive measures. (15 Periods).

Unit-III :

(a) Ecological principle : The biosphere, population and its characteristics. Classification, Natalty, Mortality, Growth rate, Fluctuations and dispersal. Factors governing distribution of flora and fauna in aquatic, terrestrial and canal habitats. Components of ecosystem; Food chain, Energy flow in an ecosystem (pond ecosystems).

(b) Introduction to bio-geochemical cycles in nature-carbon, nitrogen, sulphur and Phosphorus cycles. (15 Periods).

Unit-IV :

(a) Ecosystem studies with special reference to productivity and its measurement (Chlorophy, oxygen, carbondioxide and radioactive method).

(b) Study of different plant groups (Micro and Macro) viruses, bacteria, algae and fungi and their economic importance. Classification nutrition and reproduction of bacteria. (15 Periods).

Practical Course
Section-A

1. Detection of metal ions in solutions. Emphasis on solubility and spottests.
2. Determination of dust fall rate using dust fall Jar.
3. Fabrication of soap-bubble flowmeter and measurement of air flow rates.
4. Routine Analysis of water with respect to :
 - (i) pH measurement.
 - (ii) conductivity measurement.
 - (iii) Determination of hardness, Alkalinity D. O. and Solids.
5. Determination of permeability of soil by lysimeter.

Section-B

6. (a) Bacteria.
- (b) Enumeration of Bacteria for the given air and water sample.
- (c) Gram-staining.
7. Determination of dissolved oxygen in water.
8. Measurement of primary in a water body by light and dark bottle method-Determination.
9. Use of ocular and stage micrometer for measurement of biological specimen.
10. Observations and study of the following forms :
 - (i) Algae-Ulothrix, Anabaena, Gelidium, Botrydium.
 - (ii) Fungi-Synchytrium, Claviceps, Melanpsors, Alternaria.
11. Study, of Bryophyta-Notothylas, Targionis, porella, study of Pteridophytes-Leoceres, Salvinia.
12. Study of Gymnosperms-Thuja of Angiosperms-Acanthaceae, Cannaceae.
13. Study of the following animals and their economic importance :
 - (1) Protozoa :
 - (i) Plasmodium,
 - (ii) Entamoeba histolytica.
 - (2) Helminthes :
 - (i) Ascaris,
 - (ii) Dracunculosis,
 - (iii) Plant nematode.
14. Arthropods :
 - (i) Lobster/Prawn,
 - (ii) Oyster,
 - (iii) Teredo,
 - (iv) Patella,
 - (v) Natica, Visit to :
 - (i) NEERI, Nagpur.
 - (ii) Study of Ecosystem (soil, forest) submit a detailed report.
 - (iii) Visit N. I. O. Goa.

Distribution of Marks :

(1) 2 experiments from Section A	10 Marks
(2) 2 experiments from Section B	10 Marks
(3) Class record including field diary	5 Marks
(4) Viva-Voce	30 Marks

Books for reference :

1. The Chemistry of Environment : R. A. Horns, A. Wiley, Inter Science Publication, 1978.
2. Physical Chemistry : G. M. Barrow, INT Student Edition.
3. Sheshadri : A Text Book of Physical Chemistry.
4. R. A. Horne : Marine Chemistry, A. Wiley, Interscience Publication 1969.
5. Mahan : University Chemistry.
6. Vogel : Text Book of Qualitative and Quantitative Analysis.
7. S. R. Palit and A. K. Dey : Practical Physical Chemistry.
8. Odum, E.P. Fundamentals of Ecology.
9. Michael : Ecological Methods for Fields and Laboratory Investigation.
10. C. T. Tanopi : Fresh Water Animals of India.
11. Welch : Limnological Methods.
12. Kotpal : Concepts of Ecology.
13. Clause : Elements of Ecology.
14. Kenleigh : Animal Ecology.
15. Jorensen : Principles of Environmental Science & Tech.
16. Shels J. G. : The Oil Ecosystem.
17. P. D. Sharma : Elements of Ecology.
18. N. Balakrishnan Nair & D. M. Thanpi : A Text Book of Marine Ecology.
19. Nicol, J. A. C. : Biology of Marine Animals.
20. Kendeight : Ecology with Special reference to Animals & Men.
21. R. L. Kotpal, S. K. Agrawal, R. P. Khetarpal : Invertebrates.
22. Witalkar : Communities and Ecosystems.
23. Kumar and Singh (1970) A. T. B. of algae (Macmillan).
24. Chapman, V. J. (1968) : The Algan (Macmillan).
25. Round, F. F. (1970) : Biology of Algae.
26. Smith, G. M. (1954) : Cryptogamic Botany, Vols. I & II.
27. Das, Ganguli and Kar : College Botany, Volume-II.
28. Vasistha, B. R. Fungi.
29. Bhatia K. N. : Algae.
30. Kamat, N. D. : Algae.
31. Desikachari, T. V. : Cyanophyta (I. C. A. R.).
32. Vasistha, B. R. : Algae.
33. Fritsch, F. E. : Structure and Reproduction of Algae, Vols. I & II.
34. Saxena, A. K. and Sarabhai, R. P. : A. T. B. of Botany.

35. Pande, Mishra, Trivedi : A. T. B. of Botany (Vikas).
36. Rama Swamy, S. V. : Plant Pathology.
37. Rashid : Pterodophyta.
38. Parihar : Bryophyta.
39. Parihar : Pterodophyta.
40. Chopra : Taxonomy of Angiosperms.

BOTANY

(Effective from July, 1996 onwards)

The syllabus is based on SIX lectures and TWO practicals each of three periods duration per week.

The examination shall comprise two theory papers and a practical, each theory paper shall be of three hour's duration and carry 60 (SIXTY) marks. The practical shall be of four hour's duration and carry 30 (THIRTY) marks.

Paper-I :

Introduction to plant kingdom, Viruses, Monera, Protista, Fungi, Lichens, Plantae (Phaeodophyta, Rhodophyta, Xanthophyta, Chlorophyta), Plant pathology.

Paper-II :

Plantae (Bryophyta, Tracheophyta upto Gymnospermopsida), Paleobotany.

PAPER-I

The units for Paper-I are given at the end of the syllabus.

Sr. No.	Topic	Periods
I.	Introduction to plant Kingdom, Classical systems (two kingdom system), Validity of Thallophyta; Present day approach, five kingdom system proposed by Whittaker (1969).	2
II.	Viruses : Living and non living nature, Chemical composition multiplication, plant, animal and bacterial viruses, economic importance.	3
III.	Kingdom-I : Monera (Prokaryota) characters, classification	1

***Division :**

**	Schizomycophyta (Bacteria) :	4
	Classification, structure, reproduction, economic importance. **Mycoplasma : General account.	2

Sr. No.	Topic	Periods
**	Cyanobacteria : General characters, ultrastructure of the cell, reproduction, economic importance : Nostoc as a type study.	3
IV.	Kingdom-2 : Protista(Eukaryota) : Characters, classification.	1
*Division :		
**	Gymnomycota (Slime moulds) : Stemonities	1
**	Chrysophyta : General account of diatoms (structure, reproduction, economic importance).	3
V.	Kingdom-3 : Pungi : (Characters, classification, economic importance).	
*Division :		
****	Eumycota :	1
****	Oomycetes : Albugo	3
****	Zygomycetes : Rhizopus	3
****	Ascomycetes : Penicillium	3
****	Basidiomycetes : Puccinia	3
****	Deuteromycetes : Cercospora	2
****	Lichens : Classification, structure reproduction, economic importance.	3
VI.	Kingdom-4 : Plantae : Characters, classification	1
*Division :		
**	Phaeophyta (Brown algae) : Ectocarpus	2
**	Rhodophyta (Red algae) : Batrachospermum	3
**	Xanthophyta (Yellow-green algae) : vaucheria	3
**	Chlorophyta (Grass green algae : Oedogonium	3
	Cosmarium	1
	Chara	3
VII.*	Plant pathology :	6
*	Symptomology of fungal, bacterial and viral diseases.	
	General account of control measures (Physical, Chemical and Biological)	
*	Etiology of following plant diseases :	
	Leaf mosaic of Bhindi, Smut of Jowar (Sphacelotheca sp), Citrus canker (Xanthomonas sp.), Gummosis and root rot of Mandarin (Phytophthora sp).	

Unit-I :

Paper-I

General introduction (S. No. I) Viruses (S. No. II), Monera (S. No. III)

Unit-2 :

Protista (S. No. IV), Fungi (S. No. V) Oomycetes, Zygomycetes, Ascomycetes)

Unit-3 :

Fungi (S. No. V) Basidiomycetes, Deuteromycetes, lichens, Plant pathology (S. No. VII)

Unit-4 :

Plantae (S. No. VI)

PRACTICAL-PAPER-I

1. Study of Bacillus and Coccus form of Bacteria from permanent micropreparations.
2. Study of fungal and algal forms employing routine, staining and mounting techniques.
3. Study of specimens of crustose, foliose and fruticose lichens and permanent micropreparations.
4. Study of specimens infected by fungal, bacterial and viral forms mentioned in the syllabus under plant pathology.
5. Collection of fungal and algal specimens from the surrounding area. The specimens collected during such tours to be submitted at the time of examination.

PAPER-II

The units for paper II are given at the end of the syllabus.

Sr. No.	Topic	Periods
I.	Kingdom-4 : Plantae (Contd.)	
*Division :		
**	Bryophyta : Characters, classification	1
	Life cycle of the following forms :	
**	Class :	
***	Hepaticopsida : Marchantiales-Marchantia	4
	Jungermanniales-Porella	3
***	Anthocerotopsida : Anthoceros	3
***	Bryopsida : Sphagnum	3
	(Details of development of sex organs and sporophyte are not essential).	

Sr. No.	Topic	Periods
II. *	Division : Tracheophyta : Characters, Classification, stelar structure, concept of heterospory and seed habit, apospory and apogamy. Life cycle of living forms mentioned below : Class : (includes Pteridophytes)	4
***	Rhyniopsida : Rhyni	1
***	Psilopsida : Psilotum	3
***	Lycopsida : Selaginella	4
***	Sphenopsida : Equisetum	4
***	Filicopsida : Ophioglossales : Ophioglossum	3
	Marsileales : Marsilea (Details of development of sporangium, sex organs and embryo are not essential)	4
III. ***	Progymnospermopsida :	2
***	Concept and its evolutionary significance.	
***	Gymnospermopsida :	1
****	Characters and classification.	
**	Pteridospermales :	
	Calymmatotheca hoeninghausii	3
**	Cycadeoidales (Bennettitales) :	
	Cycadeoidea	3
****	Gnetales : Gnetum	5
****	Coniferales : Pinus	5
	(Details of development of sporangium, sex organs and embryo are not essential)	
IV.	Palaeobotany : Definition of fossil, process of Fossilization, Geological time scale, Applied aspects : Fossil fuels.	4

Paper-II

Unit-1 :

Bryophyta (S. No. I)

Unit-2 :

Tracheophyta (S. No. II upto Sphenopsida)

Unit-3 :

Tracheophyta (S. No. II Filicopsida, S. No. III Progymnospermopsida upto Cycadeoidales)

Unit-4 :

Tracheophyta (S. No. III Gnetales, Coniferales & S. No. III Palaeobotany)

PRACTICAL PAPER-II

- Study of morphological, anatomical and reproductive characters of the forms mentioned in the syllabus. Anatomical characters to be studied either by taking free hand sections or by observing the permanent micropreparations.
(Psilotum is omitted from section cutting since it is listed as endangered species : morphological and anatomical characters in Psilotum should be studied from museum specimens and permanent micropreparations respectively).
- Study of fossil forms (specimens and permanent micropreparations).
- Collection of Bryophytes, Lycopsida, Sphenopsida, members of Filicopsida, and Gymnosperms from different places.
- Students should submit their individual collection.
- One botanical excursion is compulsory.

PRACTICAL EXAMINATION

Time : 4 Hours)

(Marks : 30)

- Identify giving reasons the specimen (A) Prepare stained temporary mount. 3
- Isolate and identify giving reasons any TWO from a mixture (B) Prepare stained temporary mounts. 4
- Identify giving reasons and comment on the specimen (C) Prepare suitable temporary mounts. 4
- Identify the material (D) giving reasons. Prepare suitable temporary mounts. 4
- Identify the material (E) giving. Prepare suitable temporary mounts. 4
- Identify the spots (F, G, H, I, J, K,) with reasons. 6
- Record & collections. 5

30
-----**Recommended Books :**

- Agrios, G. N. : (1992) Plant Pathology (Academic press).
- Alexopoulos, C. J. and G. W. Mims : (1979) Introductory Mycology (Wiley Eastern Limited, New Delhi).
- Andrews, H. N. : (1961). Studies in Palaeobotany (Wiley and Sons, New York).
- Arnold, C. A. : (1947) An Introduction to Palaeobotany (McGraw Hill, New York).
- Beck, C. B. : (1960) The identity of Archaeopteris and Callixylon. Brittonia, 12 : 351-368.
- Beck, C. B. and Wright, D. C. : (1988) Progymnosperms in-Origin and Evolution of Gymnosperms, ed. C. B. Beck (Columbia Uni. Press, New York).

7. Bierhorst, D. W. : (1971) *Morphology of Vascular Plants* (Macmillan & Co. New York).
8. Bilgrami, K. S. and Dube, H. C. : (1990) *A Text book of Modern Plant Pathology* (Vikas Publ. Co.).
9. Bold, H. C. and M. J. Wynne : (1978) *Introduction to Algae - Structure and Reproduction* (Prentice-Hall of India, Pvt. Ltd.).
10. Bold, S. C. Alexopoulos, C. J. Delevoryas, T. : (1980) *Morphology of Plants and Fungi* 4th Edn. (Harper & Rows, New York).
11. Carr, N. G. and B. A. Whitten : (1973) *The Biology of the Blue Green Algae* (University of California Press, Berkeley).
12. Chamberlain, C. J. : (1935) *Gymnosperm - Structure and evolution* (University of Chicago Press).
13. Chapman, V. J. : (1962) *The Algae* (Macmillan and Co. Ltd.).
14. Chapman, V. J. and D. J. Chapman : (1973) *The Algae* (2nd Edn. Macmillan and Co. Ltd.).
15. Delevoryas, T. : (1962) *Morphology and Evolution of Fossil plants* (Holt, Reinert and Winston, New York).
16. Desikachari, T. V. : (1959) *Cyanophyta, Monograph* (ICAR, New Delhi).
17. Dodge, J. D. : (1973) *The fine structure of Algal cell* (Academic Press, London).
18. Kemes, A. J. : (1936) *Morphology of Vascular Plants, Lower groups* (Mc Graw-Hill).
19. Fogg, G. E., W. D. P. Stewart, P. Ray and A. E. Walsby (1973) *The Blue-Green Algae* (Academic Press, London).
20. Foster, A. S. and Gifford, E. M. : (1959) *Comparative Morphology of Vascular Plants* (Freeman, Sanfrancisco).
21. Ganguli, H. C. and A. K. Kar : (1987) *College Botany, Vol.-1* (New Central Book Agency, Calcutta).
22. Gupta, K. M. : (1962) *Marsilea : Monograph* (CSIR, New Delhi).
23. Jain V. K. : (1933) *Gymnosperms* (S. Chand and Co., New Delhi).
24. Kamat, N.D. : (1985) *Algae*.
25. Kumar, H. D. and H. N. Singh : (1982) *A Text Book on Algae* (Affiliate East-West Press, Pvt. Ltd. New Delhi).
26. Maheshwari, P. and Vasil, V. : (1961) *Genetum - Monograph* (CSIR, New Delhi).
27. Mehrotra, R. S. : (1992) *Plant Pathology* (Tata McGraw-Hill Book Co.).
28. Pande, B. P. : (1993) *College Botany Vol. I and II* (S. Chand and Co., New Delhi).
29. Parihar, N. S. : (1977) *The Biology and Morphology of the Pteridophytes* (Central Book Depot, Allahabad).
30. Prem Puri : (1973) *Bryophytes, A broad Perspective* (Atma Ram & Sons).
31. Prescott, G. W. : (1969) *The Algae - A Review* (Houghton Mifflinco).
32. Purvis, W. K. and Orians, G. H. : (1987) *Life (The Science of Biology)* Sinauer Associates inc. Publishers).
33. Ram Udar : (1970) *An introduction to Bryophyta* (Shashidhar Malaviya Prakashan, Lucknow).

34. Rashid, A. : (1989) *An Introduction to Pteridophyta* (Vikas Publishing House Pvt. Ltd., New Delhi).
35. Round, F. E. : (1973) *The Biology of the Algae*, 2nd Edn. (Edward Arnold).
36. Sharma, O. P. : (1983) *A manual of Practical Botany, Vol. I* (3rd Edn.) (Pragati Prakashan, Meerut).
37. Sharma, O. P. : (1986) *Text Book of of Algae* (Tata McGraw-Hill Pub. Co.).
38. Singh, R. S. : (1990). *Plant Diseases* (6th Edn.) Oxford, IBH Pub. Co., Bombay).
39. Singh, R. S. : (1992) *An introduction to Principles of Plant pathology* (Oxford and IBH Pub. Co. Bombay).
40. Smith, G. M. : (1955) *Cryptogamic Botany, Vol I and II* (Mc Graw-Hill Pub.).
41. Smith, G. M. : (1950) *Manual of Phycology* (Chronica Botanica).
42. Sporne, K. R. : (1962) *The Morphology of Pteridophytes*. (Hutchinson Univ. Library, London).
43. Sporne, K. R. : (1965) *The Morphology of Gymnosperms* (Hutchinson Univ. Library, London).
44. Stewart, W. N. and G. W. Rothwell : (1993) *Palaeotany and the Evolution of Plants* (2nd Edn.) (Cambridge Univ. Press).
45. Vasistha, B. R. : (1990) *Algae* (S. Chand and Co., New Delhi).
46. Vasistha, B. R. : (1990) *Fungi* (S. Chand and Co., New Delhi).
47. Vasistha, B. R. : (1992) *Bryophyta* (S. Chand and Co., New Delhi).
48. Vasistha, P. C. : (1992) *Pteridophyta* (S Chand and Co., New Delhi).
49. Watson, E. V. : (1964) *The structure and life of Bryophytes* (Hutchinson Univ. Library, London).
50. Whittaker, R. H. : (1969) *New concepts of Kindoms of Organisms*, Science, 163 : 150-160.
51. Whittaker, R. H. and Margulis, L. : (1978) *Protista classification and the Kingdoms of organisms*. Biosystems, 10 : 3-18.

ZOOLOGY

The examination shall comprise two theory of 3 hours duration and 60 marks each and a practical examination of 4 hours duration and 30 marks, Candidates are expected to pass separately in theory and practical examination.

The syllabus is based on 6 theory periods and 6 practical peridos perweek. Number of periods per Unit : 15.

PAPER-I NONCHORDATES

Unit-I :

Protozoa

: Life cycle of Plasmodium; Control of malarial. Protozoan diseases-Reservoir of infection, Mode of transmission, Mode of infection and pathogenicity with special emphasis on the following parasites-Entamoeba gingivalis, Trypanosoma gambiense, Leishmania tropica.

- Porifera : Structure of Sycon, Amphiblastula larva.
 Coelenterata : Structure and life cycle of obelia.
- Unit-II:*
 Platyhelminthes : Structure and life cycle of Taenia. Miracidium larva.
 Aschelminthes : Structure and life cycle of Ascaris. Parasitic adaptations in helminthes.
- Annelida : External characters, Digestive system and Unino-genital system of Hirudinaria. Tohopore larva.
- Arthropoda : Digestive and Reproductive systems of Periplaneta. Nauplius, Zoca larva.
- Unit-III:*
 Mollusca : Digestive, respiratory and Circulatory systems of Pila, Veliger, Glochidium larva.
- Echinodermata : Water-Vascular system of starfish. Bipinaria larva.
- Hemichordata : Structure of Balanoglossus : Digestive system, gonads, coelom, Tornaria larva.
- Unit-IV:*
 Applied Entomology : Life cycle and control of the following pests : Jowar stem borer, red cotton bug, citrus leafminer and stored grain weevil. Nature of insecticides and their mode of action. Insect pest control, Biological control.

PAPER-II

CYTOLOGY, ENVIRONMENTAL BIOLOGY AND ANIMALS BEHAVIOUR CYTOLOGY

Unit-I Cytology:

Ultrastructure and functions of plasma membrane, Golgi complex, Endoplasmic Reticulum, Ribosomes, Mitochondria and Lysosomes.

Unit-II:

Ultrastructure and functions of the Nucleus and Chromosomes, Structure and functions of DNA & RNA, Meiosis, Fertilization and parthenogenesis.

Unit-III Environmental Biology:

Light and temperature as environmental factors, concept of eco-systems-Definition and types. Biotic community types. Ecological pyramids and energy flow in the ecosystem. Air and water pollution-Sources-Effects on flora and fauna, Control measures.

*Unit-IV Animal Behaviour:***Ethological Concepts :**

- Innate behaviour : Reflexes, taxes, instinctive behaviour.
- Learning : Habituation, imprinting, classical and instrumental conditioning, insight.
- Social Behavior : Aggregation, mating behavior, orientation, chemical, auditory and visual stimuli and mating of sexes, courtship, intention movements, reproductive and dominance fighting territory, social order or hierarchy.

I-Practical :*I Classification of Animals (up to order) :*

- Protozoa : Amoeba, Plasmodium, Vorticella.
- Porifera : Sycon, Spongilla, Euplectella, Leucosolenia.
- Coelenterata : Obelia, Physalia, Adamsia, Tubipora.
- Platyhelminthes : Planaria, Fasciola, Taenia.
- Aschelminthes : Ascaris, Dracunculus, Microfilaria.
- Annelida : Aphrodite, Tubifex, Pontobdella.
- Arthropoda : Daphnia, Cyclops, Limulus, Centipede, Millipede, Moth, Peripatus.
- Mollusca : Chiton, Dentalium, Limnaea, Sepia.
- Echinodermata : Asterias, Ophiothrix, Holothuria, Antendon, Echinus.
- Hemichordata : Balanoglossus.

II-Practicals in Cytology :

1. Mitosis in Onion root tip.
2. Meiosis in grasshopper testies or Tradescantia buds.
3. Effect of colchioine, on mitosis chromosomes in onion root tip.
4. Vital Stainings of Mitochondria in buccal epithelium.
5. Chironomous larva/Drosophila salivary gland chromosomes.
6. Leishman staining of Barr bodies in human blood smear.

III-Practicals in Environmental Biology :

1. Estimation of CO₂ contents of water.
2. Estimation of D. O. in water by Winkler's method.
3. Plankton study of lake or pond water (qualitative).
4. Determination of pH of various water bodies.

5. Working of food chain in pond and grassland ecosystem with examples : Valisneria, Hydrill, Chara, Aquatic insects, larva/crustacean, mollusca, small fish, frog, large fish, snake, Lizard, Hawk, Kite.

IV-Practicals in Applied Entomology :

1. Collection, preservation and identification of 5 insect pests.
2. Collection, preservation and identification of any 5 beneficial insects.
3. Study of duster and sprayer for insect pest control.

V-Dissection :

1. Cockroach : Digestive system and Reproductive system.
2. Leech : Digestive system-Excretory and Reproductive system.
3. Pila : Nervous system.

VI-Slides :

- T. S. Taenia scolex, Mature and Gravid proglottids, T. S. male and female Ascaris, T. S. Balanoglossus through collar branchio-genital region.
- Larval forms : Amphiblastula, Cysticercus, Miracidium Trochophore, Nauplius, Zoca, Glochidium, Bipinnaria, Tornaria.

VII-Permanent Stained Micropreparation of the following or Mountings :

- Obelia colony, Nereis-Parapodium; cockroach-Trachea and Mouth parts, Leech-Jaws, Nephridia; Pila-gill lamella.

Larval forms-Zoea, Nauplius; Wings and mouth parts of any three insects.

Study Tour :

Class Record :

Distribution of Marks :

- | | |
|---|-----------|
| 1. Dissection | 8 |
| 2. Any one Cytology Experiment | 3 |
| 3. Any one experiment from Environmental Biology | 3 |
| 4. Identification of 5 specimens (one spot from Applied Entomology), 3 Slides | 8 |
| 5. Permanent stained micro preparation | 4 |
| 6. Class Record | 2 |
| 7. Submission of atleast 5 stained permanent slides, study tour diary etc. | 2 |
| Total : | 30 |

Books Recommended :

Nonchordates :

1. Text Book of Zoology (Vol.-I)
2. The Invertebrates : Borradaile, L. A. & Potts, F. A.
3. Invertebrate Zoology : Jordan, E. L.

4. Text Book of Invertebrate Zoology : S. N. Prasad.
5. Invertebrate Zoology : Viswanath, H.
6. Manual of Zoology (Vol. I) : Ayer, E.
7. Invertebrate Zoology : Majpuria, T. C.
8. Non-Chordate Zoology : Dhami & Dhami.
9. The Invertebrates (Vol. I & IV).
10. The Indian Zoological Memoirs : Leech, M. L. Bhatia.
11. Invertebrate Zoology : Puranik, P. G. Thakur, R. S.
12. Indian Zoological Memoirs : PILA, Beniprasad.
13. Invertebrates Phyla : R. L. Kotpal Series.
14. Invertebrate Zoology : Jordan, E. L. & Verma, P. S.

Cytology :

1. Cell Biology : De Robertis.
2. Modern Concepts of Cytology : Majpuria, T. C.
3. Cell Biology : C. B. Powar.
4. Cell Biology : Vishwanath.
5. Cell Biology : Dowben.
6. Cell Biology : Ambrose & Easty.
7. Cell Biology : Burke.
8. Cell : Warute & Bhatia.
9. Chromosomes : White.
10. Cell Structure & Function : Loewy.
11. Cell Structure & Function : Langley.
12. Text Book of Cytology : P. S. Verma & V. K. Agrawal.
13. Introduction of Cytology : Veerbala Rastogi.
14. Essentials of Cytology : C. B. Powar.
15. Introduction to Cell Biology : Stephen L. Wolee.
16. Cell : Swanson.
17. Cytology : S. C. Agarwal.

Environmental Biology and Animal Behaviour :

1. Elements of Ecology : P. D. Sharma.
2. Essentials of Ecology : P. D. Sharma.
3. Fundamentals of Environmental Biology : S. Arora.
4. Introduction to Ecology : E. P. Odum.
5. Introduction to Ecology : R. Dajoz.
6. Ecology, Pollution & Environment : Turk & Witters, Saunder's Co.
7. Wild Life in India : V. B. Saharia
8. Animal Behaviour : Halliday, T. R. & Salter, P. J. B., Vol. I.
9. Animal Behaviour : Prasad & Kashyap.
10. Animal Behaviour : Dethier & Steller.
11. Ethology : Rame Chauvin.

12. Animal Engineering : Donald R. Groffer.
13. Animal Behaviour : M. P. Arora.

Applied Entomology :

1. Hand book of Economic Entomology for South India : T. V. Ramakrishna Ayyar.
2. Agricultural Insects-Pests The Tropics & their control : Dennis Hill.
3. Destructive and Useful Insects of IV Ed. : Metcalf, Flint & Metcalf.
4. Agricultural Entomology : Hemsingh Pruthi, ICAR, New Delhi.
5. Insects : The Year Book of Agriculture, U. S. Dept. of Ariculture.
6. Insect Pests of Farm, Garden and Orchard : Davidson and pears.
7. Biological Control by Natural Enemies : Pacll Debach.
8. Outlines of Entomology : Imms.
9. Comon Insects of India : Kalynam, N. P.

Class Record :

A certified record of work done by the student.

Study tour and submission of Field Diary.**Distribution of Marks :**

	Marks
1. Identification of 3 slides, 3 speciments, 2 bones	8
2. Dissection	8
3. Permanent stained micropreparation	4
4. Any one physiology experiment	4
5. (a) Submission of atleast 5 permanent micropreparation	2
(b) Class Record	2
(c) Study tour and Field Diary	2

Total Marks : 30

GEOLOGY

The examination in Geology at the end of the First Year shall comprise of TWO THEORY Papers and a PRACTICAL examination as follows :

Paper-I : Physical Geology and General Geology.

Paper-II : Crystallography and Mineralogy (Physical, Chemical and Optical).

PRACTICAL : Crystallography and Mineralogy.

N. B.

20% of total practical marks are reserved for class records. The practical examination will be three hours' duration. Candidastes must pass separately in practical and in the total of the theory papers. The syllabus is based on six lecture periods and six practical periods as prescribed by the Executive council of Nagpur University.

PAPER-I**Physical Geology and General Geology****Unit-I :**

Scope and methods of Geology; Relation to other sciences; Earth as a member of the solar system : Gross features of the earth; Lithological and chemical composition of the crust of the earth, volcanism and eathquakes.

Unit-II :

Weathering Geological action of wind, water ice; life as a geological agent.

Unit-III :

The follwing concepts regarding origin of earth :

- (a) Nebular Hypothesis of Kant and Laplace.
- (b) Planetisimal hypothesis of Moulten and Chamberlien.
- (c) Tidal hypothesis.
- (d) Gas dust cloud hypothesis of Schmidt and Weizasoker.
- (e) Nova theory of Hyyle; Radiometric methods of determination of age of earth; Constitution of the earth; Introduction, Internal structure of the earth of the basis of Sesmological evidences; Isostay; Palaeoclimates.

Type and criteria palaeoclimaties through different ages with special reference to India.

Unit-IV :

Distrophism : Definition and types of Geosynclines and mountains, mountain building process; Elementary ideas about plate tectonics; Nature and origion of continents and ocean basins. Introduction and details of the following :

1. Expansion hypothesis.
2. Wegener and Du Toit's hypothesis of continental drift, and
3. Convection current hypothesis of Holms.

PAPER-II**Crytallography and Mineralogy****Unit-I :**

Formation of crystals; Laps of Crystallography; Constancy of interfacial aggles; rationality of indices and symmetry; Contact goniometer and its use; one-circle goniometer and its use; brief classification of crystals; crystal notations, Miller and weiss.

Unit-II :

Study of Galena, Pyrite, Tetrahydrite, Zircon, Beral, Calcite, Quartz, Berytes, Gypsum and Azinitc classes of symmetry; Twins and important types of twin laws; Common crystal imperfections.

Unit-III:

Introduction-mineral composition of Earth's Crust; Chemistry of minerals (Pseudomorphism and Polymorphism) and Physics of minerals; Classification of silicate based on silicate structures; Chemical, Physical properties and geological occurrence of the following rock forming minerals.

Quartz family, feldspars, Feldspathoids, Zeolites Pyroxenes, Amphiboles, Micas, Olivine family, Garnet family, Aluminous silicates.

Unit-IV:

Elementary mineral optics; Nature of light polarisation by (i) reflection (ii) refraction and (iii) absorption, refractive index and critical angle, methods of determination of refractive index by (I) Becke line method and (II) Abbe refractometer method a double refraction and Nicol Prism: Petrological Microscope, Optical characters of the common rock forming minerals (as mentioned under Practical) under ordinary and Parallel plane polarized light.

Practical:**Crystallography:**

Reading of crystals belonging to the classes listed under theory and common twins.

Mineralogy:

Determination of the Physical properties and identification of the following minerals:

Quartz and its varieties, orthoclase, Microcline, Albite, Labradorite, Nepheline, Leucite, Sodalite, Hypersthene, Augite, Diopside, Rhodochite Natrolite, Stalbite, Apophyllite, Tremolite, Actinolite Hornblende, Asbestos, Muscovite, Biotite, Pyroxene, Olivine, Serpentine, Tale, Zircon Apatite Beryl, Tourmaline, Fluorite, Epidote, Kaolinite, Kynite, Sillimanite, Topaz, Staurolite, Garnet, Corundum, Halite, Calcite, Dolomite, Magnesite, Siderite, Rhodochrosite, Aegagronite, Barite, Gypsum.

Optical Mineralogy:

Optical properties and identification of the following minerals in the thin sections:-

Quartz Orthoclase, Microcline, Plagioclase, Muscovite Biotite, Chlorite, Hornblende, Tremolite, Actinolite, Hypersthene, Augite, Diopside, Olivine, Serpentine, tourmaline, Staurolite, Garnet, Epidote, Nepheline, Calcite, Andalusite, Kynite, Sillimanite, Spinel, Apatite.

Books recommended:**PAPER-I****Physiology, Geology and General Geology**

1. Arthur Holmes : Principles of Physical Geology.
2. Emmons, Thiel, Staffer and Allison : Geology Principles and Processes.
3. Gulluly, Water and Woodford : Principles of Geology.

4. Steers : Unstable Earth.
5. Wegener : Origin of the Earth.
6. Smart : Origin of the Earth.
7. Cazen, Hatcher & Siemekowski : Physical Geology.
8. Sanders, J. E. Anderson (Jr.) A. Z. Carollo : Physical Geology.
9. Judson, Deffeyes and Hargrave, R. : Physical Geology.
10. Robinson, E. S. : Basic Physical Geology, John Wiley & sons (1982).

Reference:

Howell : Introduction to Geophysics.

PAPER-II**Crystallography and Mineralogy****Books recommended:**

1. Rutly and Read : Elements of Mineralogy.
2. Berry and Mason : Mineralogy.

References:

1. Dana : Text Book of Mineralogy.
2. Smith : Minerals and Microscopes.
3. Roger and Kerr : Optical Mineralogy.

GEOGRAPHY

The examination in Geography will comprise Two Theory Papers and One Practical. Theory papers shall be of Three hours' duration and shall carry 60 marks each. The Practical examination shall be of four hours' duration and shall carry 30 marks.

The following syllabus is prescribed on the basis of 3 lectures per paper per week and two practical of two periods each.

Paper I : Climatology and Oceanography-

Section (A) Climatology.

Section (B) Oceanography.

Paper II : Biogeography-

Section (A) Plant and Animal Geography.

Section (B) Soil Geography.

The number of questions in each theory paper will be as follows :-

Section A .. 5

Section B .. 3

Candidates will be required to answer six questions selecting atleast Two from each Section. Use of Stencils is allowed at the Examination.

PAPER-I**Section A-Climatology**

1. Atmosphere : its extent and composition. Elements of weather and climate.
2. Isolation:- Factors determining its distribution over the surface of the earth. Processes of heating and cooling of the atmosphere. Temporal and geographical distribution of temperature.
3. Atmospheric pressure and winds : Their interrelation and distribution. Major and minor circulation of atmosphere.
4. Humidity : forms of condensation. Types of air ascent and associated precipitation. Zonal rainfall patterns.
5. Weather systems : Development of cyclones and anticyclones and weather associated with them.
6. Principles of classification : Koppens and Austin, Millers' classification.
7. Koppens' Major climatic types : Af, Aw, Am, Bwh, BWK, Ca, Cs, Cb, Da, Db, Dc, ET, EF.

Section B-Oceanography

8. Distribution of Temperature and Salinity in Oceans, Oceans deposits.
9. Movement of Oceanic Water-waves, Tides and Currents.
10. Coral Islands and Coral reefs.

PAPER-II**BIOGEOGRAPHY****Section A-Plant and Animal Geography**

1. Nature and Scope of Biogeography.
2. Environmental factors and their importance in the distribution of plants and animal.
3. Classification of Plants and Animals.
4. The major plant communities :- Forests, grassland, deserts.
5. Major faunal areas and their significance.
6. The Zoo-geographical realms and their Fauna.
7. Ocean life and its economic significance.

Section B-Soil Geography

8. Soils, their formation, texture, fertility and structure.
9. Major soil groups of the World.
10. Soil erosion and conservation.

PRACTICAL

1. Construction of Scales : Plain, Diagonal, Comparative and Time distance.
2. Use of Meteorological Instruments :
 - (i) Maximum and Minimum Thermometers.
 - (ii) Dry and Wet Bulb Thermometers.

- (iii) Thermograph
 - (iv) Barometer.
 - (v) Barograph.
 - (vi) Anemometer.
3. Drawing of maps and diagrams. Isoleth maps to represent distribution of climatic elements. Hythergraph.
 4. Study of I. M. D. weather maps.
 5. Surveying :
 - (i) Chain and Paper Survey.
 - (ii) Abney level : Finding the angle of elevation and depression. Calculation of height of depression from the angle by Abney level.

Books recommended :**PAPER-I**

1. G. T. Trewartha : An Introduction to Climate Geography, McGraw Hill Series.
2. P. Lake : Physical Geography, Cambridge University Press.
3. M. G. Gross : Oceanography, Charles E. Mirill, Books Inc., Columbus., Ohio, 1967.
4. Sharma : Oceanography for Geographers.
5. Strahler : Physical Geography, John Wiley and Sons, Inc, New York.
6. Barry, R. G. Chorley, R. J. : Atmosphere weather and Climate, Methuen, Rome and London.

PAPER-II

1. Newbegin, M. L. : Plant and Animal Geography, Methuen, London.
2. Nicholas Polunin : Introduction to Plant Geography, Longmans.
3. Money, D. C. : Climate, Soil and Vegetation, University Tutorial Press.
4. USDA : Oxford, Calcutta, A Manual on Conservation of Soil and Water.
5. Brain, T. Bunting : Geography of Soil, Hutchinson, London.
6. Jacob, S. Joffe : ABC of Soil, Oxford Book Co.

PRACTICAL

1. Monkhouse and Wilkinson : Maps and Diagrams.
2. Singh & Dutt : Elements of Practical Geography, Students' Friend,
3. Sir David Brunt : Weather Study, Thomas Nelson and Sons, London.
4. Arthur Guest : Advanced Practical Geography, Heinemann Educational Books Ltd.

Work Experience and Social Project (Including Extension Work)

1. The WESP for B. Sc. Part-I should be a composite one consisting of topics in various science subject taught at degree classes.
2. Every student be given prior training in the laboratory before he is asked to go for Social Project.

3. After completion of Work Experience and Project Work every student should submit a report on the Work done by him duly signed by the Supervisor and the Principal of the College.
4. The Work Experience and the Social Project report shall be evaluated by Committee of Head of Science Departments and concerned supervisors. The Principal or any Head of the Department nominated by the Principal of the College shall be the Chairman of such a Committee.
5. The assessment of the Work Experience shall be internal.
6. The marks allotted for the Work Experience and Social Project Work shall be 50.
7. Marks obtained on the Work Experience and Social Project shall be forwarded to the university 15 days before the date of the Final University Practical Examination.
8. If the marks obtained by the Students on the Work Experience and Social Project exceeds of the marks obtained by him in the External Examination, then mark shall be brought to the level of the marks obtained in the External Practical Examination.

MICROBIOLOGY

The syllabus is based on 6 theory Periods and 4 Practical periods per week. Candidates are required to pass separately in the Theory and Practical examination.

Students should visit one microbiological establishment as educational tour.

Paper-I

General Microbiology

Unit-I History Microbiology:

- (a) Discovery of micro-organisms-Leeuwenhoek, Robert Hook, Zacharias Janssen.
- (b) Controversy over spontaneous generation: Contribution of Aristotle, Redi, Joblot, Needham, Spallanzani, Schulze, Schwann, Schroder, Von Dusch, Pasteur, John Tyndall.
- (c) Fermentation: Pasteur, Kützing, Bernard, Buchner.
- (d) Germ theory of Disease: Antisepsis, Anthrax, Davain, Henri, Robert Koch, Koch's postulates.
- (e) Immunology and immunization: Jenner, Pasteur, Metchnikoff, Ehrlich, Kitasato, Behring.
- (f) Pure culture concept: Lister, DeBary, Brethfield, Koch Streak plate, pour plate, slant culture.
- (g) Discovery of virus: Ivanowsky, Stanley, Twort, D'Herelle, River's postulates.
- (h) Branches of microbiology: Bacteriology, Virology, Mycology, Phycology, Parasitology, Industrial Microbiology, Environmental Microbiology, Medical Microbiology, Food Microbiology, Genomics, Genetic Engineering, Biotechnology.

Unit-II Microbiology and fine structure of bacteria:

- (a) Concept of Prokaryotes and Eukaryotes: Comparison and differences, Typical bacterial Cell.
- (b) Morphology, Size, Shape, Arrangement of bacteria.
- (c) Structure and functions of following:
 - (1) Capsule and slime layer.
 - (2) Cell wall: Chemical structure of Gm +ve and Gm -ve bacteria protoplast, sphaeroplast and L-forms.
 - (3) Cell membrane: Fluid mosaic model.
 - (4) Mesosomes: Types and functions.
 - (5) Ribosomes: Pro and Eucaryotic ribosomes, differences, polyribosomes.
 - (6) Fimbriae: Structure and function only.
 - (7) Flagella: Arrangement of flagella, structure, flagellar, spirochaetal and gliding movement, chemotaxis.
 - (8) Bacterial chromosome.
 - (9) Plasmids: definition, general characters.
 - (10) Vacuole, Cytoplasmic inclusions.
 - (11) Spores: Typical bacterial spore, types, endospore, exospores, conidiospores, sporangiospores, cysts, bacterial sporulation-types, process, germination.

Unit-III Bacterial Taxonomy and other Micro-organisms:

- (A) (1) Bergey's Manual-Introduction.
- (2) Whittaker's classification-Introduction.
- (3) Methods of classification-Intuitive, Numerical taxonomy, Genetic relatedness.
- (B) General characters of Eubacteria, Mycoplasma, Rickettsia, Actinomycetes, Chlamydia, Cyanobacteria, Archaeobacteria.
- (C) Yeast and moulds:
 - (a) General characters, morphology.
 - (b) Cultivation of yeast and moulds.
 - (c) Reproduction-Asexual, binary sexual fission budding hybridisation of yeasts.
 - (d) Lab Observation-Staining techniques, slide culture.
- (D) Algae-General characters.
- (E) Protozoa-General characters.

Unit-IV Virus and Microbial Association:

- (a) Virus:
 - (1) (a) General characters of virus, filtrability, size, shape-polyhedral, helical, complex, symmetry, capsid, capsomere, differences with cells.
 - (b) Virioids and prions.
 - (c) Naked and enveloped viruses, viral spikes.
 - (d) Viral nucleic acid-Examples of dsDNA, ssDNA, dsRNA, ssRNA.
 - (e) Interferon.

- (2) Classification viruses-LHT System.
- (3) Replication of viruses-Lytic cycle (T4)-early and late proteins, eclipses period, virulent, moderate, temperate phages, prophages Lysogeny.
- (4) Cultivation of viruses :
 - (i) Animal virus cultivation-animal inoculation, embryonated egg inoculation, cell culture.
 - (ii) Cultivation of plant viruses.
 - (iii) Plaques of phages.
 - (iv) Detection of viral growth-CPE, inhibition of cell metabolism, haemadsorption, interference, transformation, FAT, haemagglutination.
- (b) Microbial Association :

Definition and examples of positive, negative, neutral association.

 - (i) Commensalism.
 - (ii) Synergism.
 - (iii) Mutualism (Symbiosis).
 - (iv) Parasitism.
 - (v) Antagonism.

Paper-II

Microbial Physiology and Microbiological Techniques

Unit-I Microscopy and Staining :

- (A) Microscopy :
 - (1) General principles, resolving power, numerical aperture, angular aperture, magnification, Working distance.
 - (2) Compound microscope-parts, their functions, use of oil immersion objective ray diagram.
 - (3) Ray diagram, magnification, feature, application and comparative study of :
 - (i) Dark field.
 - (ii) Phase contrast.
 - (iii) Ultraviolet.
 - (iv) Fluorescent.
 - (v) Electron-transmission and scanning.
- (B) Dyes and Stains :
 - (1) Definitions-stain, dye, auxochrome, chromophore, mordant, chromogen, leukostain.
 - (2) Theory of staining.
 - (3) Principle and procedure of :
 - (i) Simple.
 - (ii) Negative.
 - (iii) Differential : Gram, Acid fast.
 - (iv) Cytological endospore, capsule.
 - (v) Microchemical : storage granule.

Unit-II Microbial Nutrition :

- (A) (a) Principles of nutrition-Basic nutritional requirements.
- (b) Types of media : liquid, solid, semi-solid, complex, synthetic, composition of beef, malt, yeast extract, peptone, agar, gelatin.
- (c) Specific media : Enriched, enrichment, selective, differential, assay, maintenance, enumeration, characterization.
- (d) Determination of nutritional requirements : Auxotroph, auxanography, replica plating technique, multipoint inoculator.
- (e) Nutritional Classification :
 - (i) on the basis of carbon source.
 - (ii) on the basis of energy source.
 - (iii) on the basis of electron acceptor types-autotroph, : heterotroph, chemotroph, phototroph, paratroph, mixotroph obligate and facultative heterotroph.
- (B) Pure Culture and Culture Characteristics :
 - (a) Mixed culture, pure culture, isolation of pure culture-serial dilution, streak plate, spread plate, pour plate, enrichment culture method, single cell isolation; special isolation, micromanipulator.
 - (b) Pure culture maintenance, Stock, culture collection centres, methods of maintenance, preservation of culture.
 - (c) Systematic study of pure culture (outline).

Unit-III Reproduction and Growth of Bacteria :

- (a) Reproduction, binary fission, budding, fragmentation, sporulation.
- (b) Growth, definition, growth phase.
- (c) Growth rate, generation time, mathematical expression of growth.
- (d) Growth curve, Diauxic phenomenon.
- (e) Synchronous and continuous culture, Helmstetter-Cummings apparatus selection by induction technique, chemostat, turbidostat, dialysis techniques for continuous culture.
- (f) Measurement of growth :
 - (i) Cell number measurement : Breed method, Proportional count method, Coulter counter method, Colony count, Membrane filter count.
 - (ii) Cell mass measurement : weight measurement, nitrogen and turbidity measurement.
 - (iii) Cell activity measurement : Biochemical activity.
- (g) Physical conditions required for growth : Temperature, pH, gaseous.

Unit-IV Microbial control :

- (a) Definitions of Terminologies-sterilization, Disinfection, Antiseptic Sanitizer, Germicide, Microbiostatic, Antimicrobial agent, Preservative.
- (b) Factors influencing antimicrobial activity.

- (c) Mechanism of cell injury-Damage of cell wall, cell membrane, inhibition of metabolic reactions.
- (d) Physical control-Temperature, Dessication, Surface Tension, Osmotic pressure, Radiations, Filtration.
- (e) Chemical control-Chemistry and mode of action of halogens, Heavy Metals & its Derivatives, Phenol and Phenolic compounds, Alcohols, Dyes, Detergents and Gaseous Sterilization.
- (f) Chemotherapeutic Agents-Definition, Characteristics of ideal antibiotic.
- (g) Standerdization of Disinfectant-Ideal disinfectant, Phenol coefficient experiment Definition of Biological Control and Examples.

Practicals :

1. Demonstration of different equipment and techniques used in Microbiology.
2. Preparation of nutrient growth and Agar.
3. Demonstration of presence of bacteria on skin, teeth, soil water, air.
4. Use and care of Microroscope.
5. Bacterial staining 1. Gram, 2. Endospore, 3. Acid fast.
6. Hanging drop method for motility.
7. Measurement of size of bacteria.
8. Cultivation & demonstration of :
 - (a) Yeast : *S. Cerevisiae*, *Candida alu bicans*.
 - (b) Moulds; *Mucor*, *Rhizopus*, *Penicillium*, *Aspergillus*,
 - (c) Slide culture techniques for fungi (Henry's method).
 - (d) Scotch tape method for study of fungi morphology.
9. Demonstration of :
 - (a) Protozoa : *E. histolytica*, *Paramoecium*.
 - (b) Algae : *Anabena*, *Nostoc*, *Chorella*.
10. Enumeration of bacteria : 11. Isolation of pure culture :
 - (i) Pour plate. (i) Spread plate.
 - (ii) Breed method (ii) Streak plate.
 - (iii) Pourplate.
12. Determination of phenol coefficient.
13. Cultivation of anaerobes.
14. Demonstration of plaques of bacteriophage.
15. Effect of salt and sugar concentration and pH on bacterial growth.
16. Viability staining technique.
17. Demonstration of replica plating technique.
18. Demonstration of oligodynamic action.
19. Demonstration of antagonism.
20. Demonstration of phototrophs.

Books for Reading :

1. General Microbiology Vols. I & II : Powar & Dagainawala, Himalaya Publication.
2. Elementary Microbiology, Vols. I & II : Dr. H. A. Modi, Akta PrakAshan.

3. Microbiology : Pelezar, Kreig, Chan, Tata McGraw Hill.
4. Fundamental Principals of Bacteriology : A. J. Salle, Tata McGraw Hill.
5. Microbiology : Davis Dulbecco, Harper & Row.
6. Microbiology Concept & Application : Pelezar, Chan, KREIG, McGraw Hill.
7. Microbiology : Orescoll, Harley, Klein, WCB.
8. Microbiology Concept & Application : Paul, Ketchum, Wiley International.
9. Microbiology Fundamental & Application : Atlas, Maxwell Macmillon.
10. General Microbiology : Hans G. Schlegel. Cambridge University Press.
11. Microbiology : Louis P. Gebhardt, Toppan co. Ltd.
12. General Microbiology : R. Y. Stanier, Macmillon.
13. Fundamentals of Microbiology : Frobisher, Toppan Co. Ltd.
14. Microbiology : K. Pyatkin, Mir Publishers.
15. Biophysics : Dr. S. Thiraviaraj, Suras Publication.
16. Concepts of Biophysics & Instrumentation : Dr. R. Yadav & Dr. R. Saxena, Emkay Publication.
17. Techniques in Microscopy & cell Biology : Sharma V. K. Tata McGraw Hill.
18. Microbiology : Essentials & Applications : M. C. Kane, Tata McGraw Hill.
19. Methods in Microbiology É J. D. Desai & Anjana Desai, Emkay Publication.
20. Mannual of diagnostic microbiology : Dr. Wadher & Dr. Bhoos reddy, Himalaya Publication.
21. Experiments with Micro organisms : R. N. Bhattacharya.
22. Experiments Microbiology : Lab. Guide : Robert C. Goss Kalyani Publication.
23. Microbial Biology : Rosendeng, Choen Holt, Sounders Publication.
24. Introduction to Cell Biology : Stephen L. Wolfe, Wordsworth Publishing Company.

BIOCHEMISTRY**PAPER-I****Physiology****Unit-I :****(A) Digestion :**

- (a) Constitution of alimentary canal and accessory organs & their functions.
- (b) Composition and sites of secretion. Various digestive juices, types of cell involved in such secretions, concept of exocring glands involved in such secretions.
- (c) Digestion & absorption of Proteins, carbohydrates & fats.

(B) Hematology :

- (a) Composition of blood.
- (b) Origin morphological structures of formed elements of blood and their fats.
- (c) Detailed account of coagulation & blood group (ABO & RH system).
- (d) RBC : O_2 & CO_2 Transport mechanism, Basic functions of hemoglobin saturation curve, haemolysis (osmotic fragility of RBC) Biochemical significance of haemolysis.

- (e) Functions of WBC, (Neutrophils, basophils, eosinophils, lymphocytes & macrophages) and platelets.

Unit-II :**(A) Hepatology :**

- (a) Histological structure of liver & types of cells.
(b) General account of detoxification system of liver.

(B) Nephrology :

- (a) Nephron structure, (Anatomy and Histology).
(b) Filtration of blood, acid-base balance and urine formation.

Unit-III :**(A) Endocrinology :**

- (a) Structure and function of endocrine glands.
(b) Hormonal Axis :

- (i) Hypothalamo-Pituitary axis.
(ii) Pituitary-Adrenal axis.
(iii) Pituitary-Thyroid axis.
(iv) Adrenal-Pancreatic axis.

- (c) Concept of Target tissues of hormones.

(B) Reproductive System :

- (a) Brief account of structure of ovary & testis.
(b) Oogenesis & spermatogenesis.
(c) Menstrual cycle & neuro-endocrine control (Brain-Thalamus-Hypothalamus-pituitary gonadal axis).
(d) Fertilisation & Lactation. (Brief idea).

Unit-IV :**Neurology and Cardiology :**

- (a) Structure of neurons (myelinated & non myelinated).
(b) Generation & conduction of nerve impulses in myelinated & non myelinated neurons.
(c) Concept of synapse & synaptic transmission.
(d) Neuromuscular junctions.
(e) Organisation of nervous system with respect to CNS, ANS & PNS.
(f) Structure of heart SA, AV & other nodes, cardiac cycle.
(g) Concept of blood pressure & measurement, circulation of blood (systemic & pulmonary).

PAPER-II**General Microbiology****Unit-I :**

- (A) History and development of microbiology 4 Periods.
(a) Controversy over spontaneous generation.
(b) Fermentation and germ theory of disease.

(B) Microscopy : 7 Periods.

- (1) General principles of optics.

- (2) Different components of the light wave (i. e. UV, IR, visible).

- (a) Compound Microscopy : Part of a compound microscope, Objectives (Numerical aperture and its importance, Resolving power of immersion objective and their importance), Oculars, condensers, mirrors, diaphragm.

Diagram showing the light path through an ordinary light compound microscope.

- (b) Darkfield Microscopy : Principle and its application.
(c) Phase contrast microscopy : Principles : Principles and its applications.
(d) UV Microscopy : Principles and applications.
(e) Fluorescent Microscopy : Principle, diagram for the path of light and applications.
(f) Electron Microscopy : Principle, ray diagram and applications. Comparison between compound microscope and electron microscope, limitations of electron microscopy.

(C) (1) Stains and staining techniques : 4 Periods.

Definition of a stain auxochrome, Classification of stains :

- (i) Nitro-stains.
(ii) Azo-stains mono, di and poly azo-stains.
(iii) Anthraquinone stains.
(iv) Thiazole stains.
(v) Quinonimine stains.
(vi) Phenylethane stains.
(vii) Xanthene stains.
(viii) Natural stains.

(2) Simple and differential staining :

Theories of staining : physical and chemical theories, staining solutions and their preparations. mordant and its functions.

- (i) Simple stains : methods of preparation, i. e. crystal violet, safranin, carbol fuchsin. Technique of staining.
(ii) Differential stains of various differential staining techniques Gram, acid-fast, Endospore etc procedure and Mechanism of staining (Principles) of Gram and endospore staining (in detail).

Unit-II :

- (A) Bacterial Morphology and subcellular structures : General Morphology of Bacteria; Shapes and sizes, well labelled diagram of a generalised bacterial cell :
(a) Slime layer and capsule, difference between the structures and functions and position of the two.
(b) Cell wall (structure in detail) : Gram+ve and Gram-ve cell walls.

- (c) Cytoplasmic membrane : lipid bilayer model of cell membrane.
- (d) Ribosomes : (1) Stoffer and Wittman model and (ii) Lake's model for the structure of 70s ribosome in detail.
- (e) Flagella : Their number and position on the cell, structure and function.
- (f) Fimbriae : Function, difference between Fimbriae and Flagella.
- (g) Chromatin materials, plasmid; Definition of plasmids. Kinds of plasmids : Conjugative and non-conjugative different classes of plasmids i. e. 7 factors, R-Plasmids. Staphylococcus plasmids, col plasmids, degradative plasmids, Tumor inducing plasmids.
- (h) Endospores : Position and shape of endospores, Detailed study of endospore structure, Endospore formation and Germination, Functions of endospore and their resistance. 8 Periods.

(B) Viruses :

- (a) General characteristics, difference between viruses and typical microbial cell. Structure; different shapes, symmetries with one example of each type. Composition of the capsid and the nucleic acids present in the viruses (i. e. ss, RNA or ds RNA, ssDNA or ds DNA).
Classification :
(i) Casjens and King.
(ii) LHT system.
Structure of a T4-bacteriophage.
- (b) Detailed study of lytic cycle and lysogeny.
- (c) General characteristics of yeasts, moulds, protozoa and algae; occurrence, biological and economic importance, morphology, Motility reproduction (sexual, asexual and budding). 7 Periods.

Unit-III :

(A) Growth :

- (a) Growth rate and generation time.
- (b) Growth curve and its various phases in detail :
(i) Synchronous growth Methods for obtaining synchronous cultures (selection by size, age and by induction).
(ii) Continuous growth Methods for obtaining continuous growth (i. e. chimostant, turbidostat and dilysis techniques).
- (c) Measurement of growth :
(i) Counting Chamber method.
(ii) Plate count method.
(iii) Membrane filter count.
(iv) Determination of cell mass.
(v) Determination of cell activity.
- (d) Physical conditions required for growth :
(i) Temperature : Classification of organisms on the basis of temperature requirements.

- (ii) Gaseous requirement : Classification of organisms on the basis of gaseous requirement.
- (iii) Hydrogenion concentration.
- (B) Nutrition :
(a) Basic Nutritional requirements : Water, inorganic elements, carbon requirements, nitrogen and sulphur, growth factors and vitamins.
(b) Determination of nutritional requirements.
(c) Types of media :
(i) Synthetic media.
(ii) Non-synthetic media : Enriched media, enrichment media, Assay media, Maintenance media, Indicator media, Transport media, selective media, differential media.
(d) Nutritional classification of bacteria : phototrophs and chemotrophs.
(e) Isolation and maintenance of pure cultures : concept of pure culture :
(i) Streak plate and pour plate methods of isolation.
(ii) Enrichment culture techniques.
(iii) Serial dilution technique.

Unit-IV : Microbial Control :

- (a) Terminology : Sterilization, Disinfection, Antiseptic, sanitizer, germicide, microbiostasis, Antimicrobial agent, preservative.
- (b) Factors influencing antimicrobial activity :
(i) Factors related to the killing agent. Intensity concentration, time of action and temperature.
(ii) Factors related to the organism being killed : Total number of organisms being killed, kind of organism, physiological state of the organism and environmental conditions. 2 Periods.
- (c) Mechanism of cell injury : Damage to cell wall, Damage to cell membrane, saturation of proteins, inhibition of metabolic reactions. 2 Periods.
- (d) Physical control :
(i) Temperature : Moist heat (autoclaves) and Dry heat (hot air oven incinerations).
(ii) Dessication.
(iii) Surface tension.
(iv) Osmotic pressure.
(v) Radiations.
(vi) UV Light.
(vii) Electricity and ultrasonic sound waves 3 periods.
(viii) Filtration.
- (e) Chemical control : (i) Antiseptics and disinfectants, Acids, Alkalies, Halogens, Heavy metals, phenols, Germicides, Detergents.
- (f) Chemotherapeutic agents : Sulphonamides. 5 Periods.

Antibiotics : Mechanism of action :

- (i) Antibiotics affecting cell wall synthesis.
- (ii) Antibiotics affecting cell membrane.
- (iii) Inhibitors of D. N. A. polymerization.
- (iv) Inhibitors of protein synthesis.
- (g) Standardization of disinfectant : Phenol coefficient.
- (h) Definition of Biological Control.

PRACTICAL

1. Demonstration, use and care of microbiological equipments.
2. Simple staining.
3. Gram staining.
4. Endospore staining.
5. Demonstration of acid-fast staining.
6. Motility of bacteria.
7. Isolation of pure culture by pour-plate and streak-plate methods.
8. Determination of phenol coefficient.
9. Cultivation of yeast and fungi physiology, histology.
10. Assay of Haemoglobin by haemoglobinometer.
11. RBC and WBC count and ESR measurement.
12. Differential leukocyte count.
13. Measurement of blood pressure by sphygmomanometer.
14. Demonstration of starch digestion by salivary amylase/serum amylase by iodine test.
15. Determination of blood groups A, B, O, AB and RH factors.
16. Demonstration of sperm motility in rats.
17. Identification of histological specimens.
18. Estimation of Ascorbic acid by dye method.
19. Estimation of glucose by Benedict quantitoxine reagent.

Books :

1. Biochemistry (Vol. 1) : S. K. Dasgupta, Macmillan & Co. Ltd. Books for B. Sc. Part-I, II & Final.
2. Biochemistry, Vol. II.

3. Biochemistry Vol. III.
4. An Introduction to Practical Biochemistry : David & Plummer.
5. Text Book of Organic Chemistry : Finar.
6. Microbiology : Davis, Ginsberg, Eisen.

ELECTRONICS

Paper-I

(Simple Numericals are expected wherever possible).

Unit-I :

Construction and characteristics of P-N Junction diode, Avalanche effect, transition capacitance, diffusion capacitance effect, Temperature effect, Zener effect, Zener diode.

Application of P-N Junction, diode as a clipper, clamper limiter, voltage multiplier, rectifier (half wave, full wave, bridge rectifier).

Point contact diode, PIN diode, Schottky diode, tunnel diode, power diode.

Unit-II :

Construction and characteristics of BJT; CB, CC mode, Input, Output and transfer characteristics for CE mode. Amplifier fundamentals in CE mode, load line analysis. Construction and characteristics of FET, MOSFET (depletion and enhancement).

Unit-III :

Construction and characteristics of UJT, SCR, DIAC and TRIAC, UJT as a relaxation oscillator, SCR as a current controlling device. Construction and characteristics of photo Electronic devices-Photo conductive cell, Photo Voltaic cell, LDR, LED, seven segment display, dynamic scattering & field effect type LASER diode.

Unit-IV :

Introduction to Integrated circuit, Technology, Advantages, disadvantages, monolithic Integrated circuit technology, basic processes in monolithic Integrated substrate preparation, epitaxial growth, diffusion (physical idea only) Photolithography, monolithic Integrated components-Integrated resistors, capacitor, diode, transistor NPN & PNP Introduction to SSI, MSI, LSI, VLSI, types of IC packages.

Paper-II

Unit-I :

Transducers : Concept of transducer, general requirements of transducer, definition of active and passive transducer.

Displacement transducers : Strain gauge, LVDT, capacitive moving coil, electrodynamic microphone and loudspeaker.

Temperature transducers : Thermister, comparison between thermocouple and thermister as thermometer. Measurement of Flow (hot wire Anaemometer).

Velocity transducers : for linear velocity-moving magnet type electromagnetic transducers/for angular velocity capacitive Tachometer.
 Pressure measurement : Piezoelectric transducer, Radiation measurement : photo-tube, Photomultiplier tube.

Unit-II :

Principle, construction of PMMC with Dair-band suspension Galvanometer, multirange DC ammeter, multirange Voltmeter (AC/DC, Ohm per volt rating, Loading effect, Average detector, Peak detector, series and shunt type Ohmmeter, multimeter (single range), Basic principles of Electronic Voltmeter (Analogue FET type).

Unit-III :

Ideal Voltage and current sources (AC/DC), statement and proof of superposition theorem, Thevenin theorem, Norton theorem, Millman theorem, Maximum power transfer theorem (Explanation with simple numericals with DC sources only).

Bridges : General conditions of balance of AC bridge, Owen's Bridge, Scherring Bridge.

Unit-IV :

Cathode Ray Oscilloscope : CRT diagram, Electro-static focusing, deflection sensitivity, block diagram of CRO, Horizontal and Vertical deflection system, Time-base circuit using UJT, Necessity and concept of delay circuit. Concept of synchronization and necessity, CRO probe (only passive). Use of CRO for measurement of voltage Frequency, phase and study of waveforms. Limitations of CRO with respect to its bandwidth, dual trace CRO and its limitations.

Practicals :

The laboratory work for B. Sc. Part-I is divided into two parts i. e. Section A and Section B.

Section A : (Work Shop) :

Following workshop practical is to be undertaken in the laboratory and the detailed report (duly signed by the teacher concerned) should be submitted at the time of the examination.

The report should consist of theory and laboratory work on the following items :

1. Identification and function of different tools required in Electronics laboratory.
2. Use of Analogue multimeter.

3. Identification, information regarding construction function and testing of different types of resistors different types of capacitors, Inductors, different types of transformers, different types of potentiometers.
4. Colour coding system for resistor and capacitor.
5. Study of circuit-resistances in series and parallel (with respect to tolerance and power).
Capacitor in series and parallel (C_p - r_p , C_s - r_s).
6. Identification and testing of diode, transistor, LED, LDR, SCR, TRIAC, DIAC, FET, MOSFET different transducers Loudspeaker and microphone.

Section B : It is divided into two parts part-I & Part-II Atleast seven experiments from each parts must be performed and the practical record book duly signed should be submitted at the time of University Examination. Each student is expected to perform one experiment from each part, in the University Examination.

Section B : Part-I :

1. Study of Gang capacitor (variation of capacitance with angle, varying different dielectrics).
2. Study of Inductors, Verification of Terman's equation.
3. Study of IFT, Frequency response and quality factors.
4. Study of transformers L_p , L_s , and n determination.
5. Study of Multirange Ammeter, DC only.
6. Study of Multirange Voltmeter DC & AC.
7. Study of Series type Ohm-meter.
8. Study of Shunt type Ohm-meter.
9. Study of Scherring Bridge.
10. Study of Owen's Bridge.
11. Study of capacitive transducer and its calibration.
12. Study of LVDT and its calibration.
13. Study of loading effect using Voltmeter, Avometer and DMM.

Section B : Part-II :

1. Study of Forward bias characteristics of Ge, Si, diodes & LED (Calculation of various parameters).
2. Study reverse bias characteristics of different diodes (PIN, Zener, point contact diode).

3. Study of Half wave, Full wave, and bridge rectifier with varying Load.
4. Study of BJT Input, Output and transfer characteristics for CE mode only.
5. Study of Characteristics of UJT (Calculation of various Parameter).
6. Study of UJT as a relaxation Oscillator.
7. Study of Characteristics of SCR.
8. Study of FET.
9. Study of Characteristics of MOSFET (enhancement and depletion mode).
10. Study of Characteristics of DIAC and TRIAC.
11. Study of Characteristics of LDR.
12. Study of Characteristics of thermister-PTC/NTC.
13. Study of Photovoltaic cell.
14. Study of Lockin cell.

Distribution of Marks :

Section A	Record	Short Expt.	Viva	Total)	
	2	4	2	8	Total : 30
Section B	Record	Expt. Part-I	Part-II	Viva	Total)
	4	7	7	4	22)

Reference Books :

1. Hand book of Electronics : Vols. 1, 2, 3 TMH.
2. Electronic and Electrical Measurement and Instrumentation : A. K. Sawhney.
3. Electronic Devices and Circuits : Allen Mottershed.
4. Electronics Fundamental and Application : Ryder.
5. Electronics, Discrete and Integrated Circuits : Y. M. Bapat.
6. Basic Electronics and Linear Circuits : R. N. Bhargawa.
7. Basic Electronics : Grob.
8. Basic Electronics : B. L. Theraja.
9. Electronics Principles : Malvino.
10. Solid State Electronics : Frank Tedisini.
11. Electronic Instrumentation and Measurement Technology : W. D. Cooper.
12. Integrated Electronics : Millman & Hucias.
13. Modern Electronic Equipment : Trouble Shooting Repair and Maintenance : R. S. Khandpur.

**Computer Science
PAPER-I**

Introduction to Computer Organisation

Unit-I :**Introduction to Computers :**

Historical Background, Types of Computer : Digital, Analog, Hybrid, Classification of Computers. Micro, Mini, Main frame, Super Computers, parallel computers.

Computer Generations : Characteristics of Computer. Applications of Computers in Commercial & Scientific areas.

Number Systems : Bit, Nibble, Byte concept, Decimal, Binary, Octal, Hexadecimal Number system & conversions, Binary additions, subtraction using 1s and 2s compliments method, Binary codes : BCD (8421), ASCII, EBCDIC, Parity.

Symbolic representation of Logic gates and their operation. Truth Tables : NOT, OR, AND, NOR, NAND, XOR, Applications of Boolean logic, Demorgan's theorem, Half & Full Adder.

Unit-II :**Architecture of Computers :**

Block Diagram, Functions of each unit (I/P, CPU, O/P), Computer instructions, formats and instruction execution, Bus/Organization : Data, address and Control Bus organization, Memory Unit-Sequential and random access memory, semiconductor memories, Volatile & nonvolatile memories : RAM, ROM, PROM, EPROM, Magnetic memories, Bubble memory, core memory.

Unit-III :**Peripheral Support Systems :**

Introduction to Auxiliary Memory Devices : Types (Sequential & Random) devices. Sequential access devices, Magnetic tape, Cartridge.

Random Access Devices : Hard Disk, Different types of hard disks, Floppy Disks.

I/O Devices : Keyboard, VDU, Magnetic tape drive.

Printers : Line, Character, Page printers, Dot Matrix, Line & Daisy wheel printers, Laser printer.

Other types of I/O Devices : Plotters, Scanners, MICR, OCR, COM, OMR, Mouse, Barcode, Voice O/P & Light pen.

Unit-IV :**Operating System Concepts :**

Introduction, importance, Characteristics of good OS, Basic components of OS and a Simple Model. Concepts of Batch, Online, Single user & Multiuser OS.

MS-DOS : Different file specifications, Command : Internal & External-commands, syntaxes, (DIR, COPY, DISKCOPY, DISKCPM, FORMAT, TYPE, DATE, TIME).

Networks : Comparative study of LINE, STAR (Wheel), RING (circular) & MESH (free), LAN WAN.

PAPER-II

Programming Techniques and Basic

Unit-I :

Programming Techniques :

Identification of problems, problem solving techniques, Algorithm, types of Algorithm and some fundamental algorithms. Flowcharts and their need, Pseudocode for different Applications. Higher level Languages and their comparative study (BASIC, COBOL, FORTRAN, PASCAL, and c.) Compilers, interpreter and their applications.

Unit-II :

Basic Programming-I :

Introduction, Character set, Word formation, Constants and variables. Types of constants and variables, precision of numbers.

Operators : Arithmetic, Relational and Logical (Boolean), Arithmetic expressions, concentration. Hierarchy of operations, use of paranthesis.

BASIC Statements : Executable, nonexecutable, I/O and assignment control statements branching, unconditional and conditional.

Overview of complete BASIC programme :

Unit-III :

Basic Programming-II :

Looping, Library functions, subscripted variables (Single & Double dimension Arrays) Declarative statements, Matrix manipulations (without MAT statement), programmes based on above structures including sorting (Sequentnal and Bubble Sort). Searching (Linear and Binary) Merging.

User defined functions. Subroutines, CHAIN and CALL Statements.

Unit-IV :

Basic Programming-III :

Field, Record and file concepts. Data files, Sequential and Random, File processing : Creation, updation and retrieval.

Graphics : Graphics statements and techniques. Graphic resolutions (Medium and High).

Simple programmes : Nesting of Boxes, Bouncing Balls etc.

List of Practicals

A student has to perform atleast 10 exercises from each group and Two exercises at the time of Examination, One from each group.

Group A :

1. Practical on MS-DOS Operating System :
-System Booting.
-Formating disk, backup process.
-Files making & protecting the files.
-Directory, filename & path.
-Text editing & data editing through EDLIN.
-File printing (TYPE & PRINT).
-Sorting & Merging.

2. Practise of Different Commands.

Built-in Commands : DIR, CLS, COPY, DEL, REN, MD, CD, RD. Transient Commands : DISKCOPY, CKHDSK.

Group B :

1. Problems on FOR NEXT and IF-THEN-ELSE statements.
2. Problems on user difined functions and subroutines.
3. Problems on string manipulation in BASIC.
4. Problems on one dimensional arrays (sorting, searching merging, deleting, inserting etc.).
5. Problems on two dimensional arrays (matrix operations).
6. Evaluation of series such as $\sin(x)$, $\cos(x)$, $\exp(x)$ fibbonaci seris, etc.
7. Problems on sequential and random files in BASIC (creating, reading, appending, modifying, sorting, merging operations etc.).
8. Drawing a different shapes, figures, points, line, square, rectangle, circle, ellipse etc. Drawing bar graphs & pic, charts using character set.
9. Simple problems on CHAIN and CALL STATEMENTS.

Recommended Books :

1. Principles of programming : Schaum's Outline.
2. Programming in BASIC : Venit.
3. Introduction to Computer Science : C. W. Gear, Instat Pub.
4. Introduction to Computer Science : Trembley and Bunt, McGraw Hill.
5. PASCAL AND INTRODUCTION TO MODERN PROGRAMMING : I. G. Goldstein.
6. How to Solve it By Computer : R. G. Drommy, Prentice Hall.
7. Programming in BASIC : Balguruswamy.
8. Programming in BASIC : Gottfried. (Schaum's Outline).

Mathematics
Paper-I
Calculus and Geometry

Unit-I : Variables, function, limits, Continuity Curvature, Indeterminate forms.

Unit-II : Partial derivative, total differentials and total derivatives; Implicit functions, directional derivatives, maximum and minimum values.

Unit-III : Integration by partial fractions; curve tracing, the definite integral, plane areas by integration; Volume of solids revolution.

Unit-IV : Infinite sequences and series; tests for convergence and divergence of positive series; Series negative terms, Series expansion of function; McLaurin's and Taylor's formular with remainders.

Unit-V : Planes and straight loes.

Text Books :

1. Calculus 2/Ed. : Frank Avres, Jr. Schaum's Outline Series, McGraw Hill, International Book Company Singapore, 1981.
Chapters-1, 2, 3, 17, 22, 24, 29, 33, 34, 35, 47, 48, 49, 53, 56, 57, 58, 60.
2. Analytical Solid Geometry : Shanti Narayan.
Sections-2, 1 to 2, 4; 2, 42; 2, 7; 3, 11; 3, 2, 3, 3, 3, 4, 3, 6, 3, 7.

Paper-II

Differential Equations and Theory of Equations

Unit-I : First order equations : Homogeneous equations, exact equations; integrating factor linear equations, reduction of order.

Unit-II : Second order linear equations : General solution of the homogeneous equation. Use of a known solution to find another. The uhomogeneous equation with constant coefficient. Method of undetermined coefficients.

Unit-III : Methods of variation of parameters. Higher order linear equations. Operation methods for finding particular solution. Oscillations and the Sturm separation theorem. Sturm Comparison theorem.

Unit-IV : Theory of Equations.

Unit-V : Theory of Equations (Conts).

Text Books :

1. Differential Equations with Applications and Historical Notes : G. F. Simmons. McGraw, 1991.
Articles : 7-11, 14-19, 22, 23, 24, 25.
2. Higher Algebra : H. S. Hall and J. R. Knight.
AITBS publishers and distributors, Delhi, 1991.

Unit-IV : Article 534 to 563.

Unit-V : Article 564 to 586.

Paper-III

Linear Programming, Complex Numbers and Statitics

Unit-I : Complex numbers.

Unit-II : Linear Programming : Standard form.
Linear Programming : Theory of Solutions.

Unit-III : Linear Programming : The Simplex method.
Linear Programming Duality.

Unit-IV : Integer Programming : The transportation algorithm, Non-linear programming; Single variable, optimization.

Unit-V : Coplanar forces, friction.

Text Books :

1. Complex Variables : M. R. Spiegel-Schaum's Outline Series, McGraw Hil,l book Co., 1981.
Unit-I : Chapter-I.
2. Operations Research : R. Bronson-Schau's Outline Series, McGraw Hill,
Unit-II : Chapter 2, 3, Unit-III : Chapt. 4, 5, Unit-IV : Chapt. 8, 10.
3. Statics : R. S. Verma (4th Edition). Pothishala (Pvt.) ltd.
Unit-V : Articale 4, 1, 4, 11, 4, 12, 4, 2, 4, 4, 5, 1 to 5, 6.

STATISTICS

The examinations in Statistics will comprise two theory papers and a practical examination. Each theory paper will be of three hour's duration and carry 60 marks. The Practical examination will be of three hours' duration and carry 30 marks.

The distribution of marks for practical will be as follows :

Record	..	5 marks
Viva-voce	..	5 marks
Practical Problems	..	20 marks
Total	..	30 marks

The syllabus is based on theory periods and six practical periods per week.

Paper-I**Probability and Distributions****Unit-I :**

Random experiments, Sample Space, events; probability-Discrete probability, finite sample equally likely outcomes, Continuous probability and probability density function. Independent events, conditional probability.

Unit-II :

Random variables-discrete and continuous, cumulative probability distribution function, expectation and moments of various orders, probability generating function, moment generating function and their properties.

Unit-III :

Mean, median, mode, measures of dispersion-variance standard, deviation, absolute mean deviation, quartile deviation and range. Coefficient of variation moments, measures of skewness and kurtosis.

Unit-IV :

Standard distribution-hypergeometric, binomial, Poisson geometric, negative binomial uniform; exponential.

Books recommended :

1. P. L. Meyer : Introduction to Probability and Statistics.
2. P. G. Hoel : Introduction to Mathematical Statistics.
3. Goon, Gupta and Dasgupta : Fundamentals of Statistics, Vol.-I.
4. Kenny and Keeping : Mathematics of Statistics Part-I.

Paper-II**Computer Oriented Statistical Method****Unit-I :**

Collection of data, their methods, preparation of questionnaire, classification, tabulation, diagrammatic and graphical representation or statistical data.

Unit-II :

Calculus of finite difference operators and properties and relations. Divided differences and their properties. Different methods of Interpolation. (Newton's, Lagrange's, Interpolation formulae).

Numerical integration, Trapezoidal, Simpson's one third and three eight rules.

Theory of difference equations, linear, homogeneous and nonhomogeneous equations of first and second order.

Unit-III :

Introduction to computing, concepts. The system concept, types of systems, Generation of computers (I, II, III, IV), Personal Computers, future development, Input devices, the C. P. U. Memory unit, storage devices, output devices.

Unit-IV :

Computer Programming : Introduction to programming operating system, programming concepts, programming steps, as higher level of Programming Language, programming in BASIC.

Books recommended :

1. Goon, Gupta and Dasgupta : Fundamentals of Statistics, Vol. I.
2. Croxton and Cowder : Applied General Statistics.
3. Saena, H. C. : Calculus of Finite Differences.
4. Richardson : Calculus of Finite Differences.
5. Davis, G. B. : Computer Data Processing.
6. Gutfried, B. S. : Theory and Problems of Programming with BASIC, Schaum's Outline Series.
7. V. K. Jain : Basic Programming.
8. Balguruswamy, E. : Programming in Basic.

PRACTICALS

1. Classification and Tabulation of Data, Graphical and Diagrammatic representation of Dta.
2. Problems on interpolation using different methods.
3. Problems on numerical integration.

4. Computer programmes in BASIC for various statistical methods :
 (a) Simple Programmes on A. M. Median, Range Standard Deviation.
 (b) Problems on numerical integration.
 (c) Tabulation of Result Sheet.
 (d) Fitting of Binomial distribution.

5. Measures of location, dispersion, skewness and kurtosis.
 6. Fitting of Binomial and Poisson distributions.
 7. Fitting of Negative Binomial Distribution.

Notes :

- Each Students of B. A. /B. Sc. be necessarily provided with one separate calculating machine for his/her complete individual use during the practical classes and Examination. In case of electronic calculators, it should be 12 digit, 1 memory, desk calculator with basic mathematical operation only and without trigonometrical exponential, logarithmic and statistical functions.
- Atleast Two PC should be provided to the Department Statistics in a College.

THEORY PAPER**Electronic Equipment Maintenance****Paper-I****Principles of Electronics****Unitisation :****Unit-I : Resistors :**

General Information : Symbol, Colour Code, Types (such as Carbon, Metal film, thin film, thick film, Wire-wound) Variable resistors, Potentiometers (Logarithmic, Linear, Mathiturn wire wound rheostat). Physical Properties : Temperature Dependence (Thermistor) Light dependence (L. D. R.), Voltage dependence (V. D. R.) Technical Specification : Wattage and Working Voltage.
 Methods of measurement of Resistance : Very low to very high value (4 L).

Inductors :

General Information : Symbol, Types such as Air core, Iron core, Ferite core, Choking Inductors (coil), Frequency response of an Inductor.

Method of Measurement of Inductance : Using Universal Bridge, Design and Fabrication Rules. (3 L).

Transformers :

General Information : Principle, Types of Transformers such as single Phase, Auto, Mains and Isolation transformer, Frequency dependence of an Inductor.
 Method of Measurement of Inductance : Using Universal Bridge, Design and Fabrication Rules. (5 L).

Capacitors :

General Information : Symbol, Colour Code, Types of Capacitors such as Air, Paper, Electrolytic, Mica, tantalum, Polystyrene.

Fixed and Variable Capacitors.

Specification of Capacitor :- Power Factor, Working Voltage.

Mesurement of Capacitance : Universal Bridge, Application Areas (4 L). PCB Types of PCB, layout techniques, Cables and Connectors for P C B (2 L).

Unit-II :**Relays :**

General Information : Symbol, Types of Relays, such as Reed, Electromagnetic.
 Specifications : Ratings, Application Areas (4 L).

Microphones and Loudspeakers :

General Information - Principle, Types, Specification : Frequency Responce, Input and Output Impedance, Power Rating, Size, Directionality (omni and uni-directional). (5 L) Application Areas.

Transducers :

Commonly used Transducers like L D R, thermistors, Thermocouples, Photodiodes, Photo Transistors, I R Detectors L V D T. (3 L).

Switches, Cables and Connectors :

S P D F T D P D T, Band Switches, Touch Switches, Thump wheel Switches, Micro-Switches, specifications, Application Areas (3 L).

Batteries and Fuses :

Dty Cells, head-Acid Accumulators, Nickel Cakmium Cells, Standard Cells, Principle, Specification. (1 L). Fast and slow Fuses, pilot Lamps.

Unit-III :**Network Theorems :**

Kirchhoff's Current and Voltage Law, Maximum Power Transfer Theorem. (6 L)
 Thevenin's Theorem, Norton's Theorem, Superposition Theorem.

L C R and Waveshaping Circuits :

Serial and Parallel Response, Idea of Black Box, Equivald Circuits, Idea of Two Terminal and Two Port Networks, Equivalent Circuits, Integration, Differentiation Wing R. C. Circuits, Clipping, Clamping.

Unit-IV :**Introduction to De : Number Systems :**

Introduction to Decimal, Binary, Octal, Hexadecimal Number systems, B C D Codes, Interconversions of D Decimal, Binary & B C D Numbers, Parity, Excess-3, Gray and Johnnan Codes (3 L).

Logic Gates :

Positive and Negative Logic, Different Logic Gates such as AND, OR, NOT, NAND, NOR, EXOR. Symbol and Truth Tables, Inverting and Non-Inverting Buffers (3 L).

Logic Families :

TTL, ECL, & CMOS Parameters like Power Dissipation, Speed, Supply Requirements, Logic level, Fan In, Fan Out, Noise Immunity (6 L).

Binary Arithmetic and Boolean Algebra :

Boolean Anioms, D Morgan's Theorems Ê- Statement, Verification and Applications. Ones Complement. Half adder, Full Adder, Half Subtractor. (4 L).

Unit-V :**Combinational Circuits :**

Encoders, Decoders (4 L).

Sequential Circuits :

Flip Flops (RS, K, D, T, N, S) Shift Registers, Counters (8L).

Memories :

Semiconductor Memories. (6 L).

Paper-II**Electronic Devices, Components and Assembling****Unit-I :****Introduction to Semiconductors :**

Energy band diagram, Conductor, Semi conductor, Insulator, Intrinsic and extrinsic semiconductors (p, n type), Diffused Junctions, Depletion Layer, Barrier potential. (2 L).

Junction Diodes : Rectifying diodes, forward and reverse bias characteristic, switching diode, varactor diode, Photo diode, light emitting diode, IR Sources and detectors, Optical isolators, Zener diodes. (6 L).

Bipolar Junction Transistor : Basic working principle (qualitative), characteristics, basic configuration and biasing, operating point, load line, biasing for stabilization of operating point. (4 L).

Unijunction Transistor : Basic working principle (qualitative), Characteristics, Applications as switch. (2 L).

Unit-II :

Jfet and Mosfet : Basic working principle (qualitative) characteristics, pinchoff voltage. (4 L).

Power control Devices : Four layer diode. (PNPN), Silicon controlled Rectifier (-*SCR), Triacs, Diacs, Principles and Characteristics. (2 L).

Amplifiers : Different terms used in amplifiers, such as signal, source, input, output, voltage and current gain, power gain, decibel, input and output impedance. Classification of amplifiers according to the frequency response, RC coupled class A common emitter amplifier, introduction to Class B operation. (7 L).

Feed Back in Amplifiers : Effect of negative feed back on amplifier Performance. (2 L).

Unit-III :

Power Amplifiers : Transformer coupled equivalent circuit only in brief; Class A, Class B, Class AB and Class C, The constant power hyperbola, the AC load line, Input and output considerations, Determination of non-linear distortion. Push-pull amplifiers : Phase splitter circuits, complementary push-pull, Thermal runaway, heat sinks. Class B and C resonant load amplifiers, Graphical class C analysis, resonant load requirements. (6 L).

Oscillators : Positive feedback, Barkhausen criteria, phase shift oscillators, Wien Bridge oscillator, Tuned oscillator, Hartley, Colpitts-oscillators, crystal oscillator. (5 L)

IC 555 : Operation and application. (3 L)

Unit-IV :**Operational Amplifiers :**

Basic idea of an OPAMP with, black box. concept, inverting and non-inverting inputs, virtual ground. Parameters such as input impedance, output impedance, open loop gain, measurements of parameters. Qualitative description of OPAMP as inverting and non-inverting amplifier, summing and difference amplifier, comparator and linear integrator, instrumentation amplifier. (10 L).

Power Supplies : Regulated power supply, Zener regulated power supply, series and shunt regulated power supply, block diagram of IC 723, regulated supply using IC 723. Three terminal ICS power supply, Study of power supply with respect to variation in load and line Voltage. Switched mode power supply, design principle and application. (6 L).

Unit-V :**Modulation :**

AM and FM principles, modulation index, modulation band width, balanced modulator. (4 L).

Demodulation : AM and FM detectors, diode detector, ratio detector, balanced demodulator. (4 L).

Introduction to Communication systems : Basic principles and operation of Communication system. (4 L).

LABORATORY EXPERIMENTS

Group A:

1. Practice for use of multimeter (ordinary & Electronic), Power supply, oscilloscopes signal generator.
2. Study of resistor capacitor and diodes.
3. Study of transistors.
4. Study of L D R, thermistor.
5. Study of Zener diode and power supply.
6. Study of S C R and its firing characteristics.
7. Study of bread board, IC types, pin numbers, and IC manual.
8. Study of logic levels thresholds for input and to observe propagation delay.
9. Study of different types of LED'S and seven segment display.

Group B:

1. Study of amplifier.
2. Study of oscillator.
3. Study of AM/FM modulator.
4. Study of 7447 to 7 segment decoder.
5. study of AND, OR, NOT, NOR, NAND and EXOR gate.
6. Study of shift register.
7. Study of IC counter.
8. Study of IC flipflop.
9. Study of A/D and D/A convertor.

- Notes:
- (1) Students are expected to perform all experiments.
 - (2) Student is expected to perform two experiments during practical examination. One experiment is from group A and one is from group B.

Appointment of Reference for Evaluation of

Thesis and Dissertation

Item No. 6:

Prepared the panel of References for evaluation of thesis and dissertations and for conduct of Viva-Voce Examinations, Wherever prescribed for awarding Post-Graduate, doctorate and higher degrees Under Section 38 (f) of Maharashtra University Act, 1994.

N/A

Item No. 5:

Any other item with the permission of the Chair.

N/A

Chairman

Industrial Fish and Fisheries

The syllabus is based on 6 theory period and two practicals of six period per week. The examination shall comprise of 2 theory papers of 50 marks each, of three hours' duration and practical of 6 hours' duration carrying 50 marks.

The Candidates are required to pass, separately, in theory and practical examination.

Unit-I:

Biology of Fish:

Need, Data requirement for Classification: External morphology of an Elasmobranch, Teleost, Prawn, Crab, lobster, fivalve, gastropod & cephalopod variations in form & structure skin, Colouration, scale, Mouth Jawa, teeth, fine, spines, barbels in taxonomic studies.

Unit-II:

Internal Anatomy of Fish:

Dignitive, circulatory, respiratory, reproductive, nervous system, Sense: Organ & lateral line receptors, electric organ, sound producing organ, enmircent organ swim bladder, chemoreceptors.

Unit-III:

Food and feeding habits of fresh water and marine fishes, praw crab, lobster, bivalve, gastropod & cephalopod. Stomach contents-Seasonal changes in food availability and food preferences, feeding intensity and utilization of food. Excretion & osmoregulation in fresh water of marine fishes; Migration of fish, Social behaviour of fish-aggregation & sholting.

Unit-IV:

Methods of growth studies-marking & tagging length-weight relationship, ponderal index, relative, condition factor and Gonadosomatri index. Reproduction-Reproductive behaviour & povental care, Sexual dimorphism, Maturity studies-size at first maturity.

Unit-V:

Estimation of fecundity, ova diameter frequency, fecundity in relation to weight, length & food supply. Spawning habits, spawning sear on spawning frequency, factors, affecting spawning, Types of eggs, pre-embryonic and port embryo development in major carps. Metamorphosis, Larval life & feeding habbits.

Paper-II

Unit-I:

Capture Fisheries

Significance of capture fisheries, estimates & potentials of capture fisheries. Inland capture fisheries resources of India. Riverine fisheries of major & minor carps, cat fishes, effect of pollution on riverine capture fisheries problems of management. Cold water fishery resources of India, fishery of Mahseer, tron-salmon, development & management.

Unit-II :

Lacustrine fisheries : Brief idea of reservoir fisheries of India, pre and post important surveys, Management & development of lacustrine fisheries, Estuarine fisheries resources of India. Brief idea of fisheries of different estuarine brackish water lake, & back waters of India.

Unit-III :

Marine fishery resources of India, fishery resources of continental shelf problem of in shore fisheries, exploitation and management of under exploited & unexploited resources of exclusive economic zone (E. E. Z.).

Unit-IV :

Pelagic fisheries resources of oil sardine anchovies mackerel ribbon fishes, tunas, and sea bream and cephalopod, Midwater & demersal fisheries : elasmobranch, Bombay duck, cat fishes, silver bellis, pomfret, flat, fishes prawn, lobster, crabs and mussel.

Unit-V :

Biological aspects of fishery management, Principles of conservation and development, Population dynamics-concepts recruitment and yield. Problems of over fishing, MSY, MEY, QSY. Brief idea about the fishery resources surveys of different marine zones.

Time : 6 Hours)**PRACTICALS****(Marks : 50**

1. External morphology & Morphometrical study of a fish, prawn, crab, lobster, bivalve, cephalopod.
2. Method of collection, handling, identification and preservation of animals.
3. Identification of commercially important fresh water and marine fishes, prawns, crab, bivalve & cephalopod of India.
4. Preparation of wet & dry mounts, wax & plaster casting, alizarin preparation and study of teleost skeleton.
5. Dissection of digestive, nervous reproductive and accessory respiratory organs and gas bladder of fish.
6. Dissection of prawn : Digestive, Nervous system.
7. Dissection of crab : Digestive Nervous system.
8. Plankton analysis-Quantitative Qualitative and (preparation of permanent stained).
9. Feeding habits : Analysis of stomach content qualitative & quantitative.
10. Growth : Estimation of growth & age by using scales & otoliths-length weight relationship & ponderal index.
11. Classification of maturity stages in male & female fish.

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